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July 31, 2002

Mr. Michael Ribordy
U. S. EPA – Region 5
77 West Jackson Boulevard (SR-6J)
Chicago, IL 60604-3590

RE: Response to Comments on Mitgation Plan
Dead Creek Sediment Removal Action
Sauget Area 1, Sauget and Cahokia, Illinois

Dear Mr. Ribordy:

Attached are Solutia's responses to the comments provided by U. S. EPA on the Dead Creek Mitgation Plan submitted by Solutia on May 21, 2002. These comments were provided to us on June 17, 2002 and June 27, 2002. They were discussed in a teleconference held on July 17, 2002 and the responses included in the attachment to this letter reflect the results of that discussion.

If you have any questions, about the attached material, or require additional information, please do not hesitate to call me at (618) 482-8538.

Sincerely,

Alan G. Faust
Project Coordinator

Attachment 1

Dead Creek Sediment Removal Action

Mitigation Plan

Response to Comments

General Comments

1. There does not appear to be any integration of the information from the habitat survey (Section 2 and Appendix 1) with the creek channel mitigation plan (Section 3). For example, the habitat survey clearly shows an abundant and diverse array of forbs and shrubs currently provide much of the habitat, yet only grasses are proposed for remediation.

Response:

Creek Segments B, C, D and E

Revegetation of the channel and top of bank area in Creek Segments B, C, D and D with grasses, instead of trees, shrubs and forbs, was proposed for the following reasons:

- Grasses were the original plant species prevalent in this area and local experts prefer to use them rather than trees, shrubs and forbs for restoration projects;

- Grasses are less likely to be perceived as weeds than forbs in developed and agricultural areas or undeveloped areas near residential/commercial areas and, therefore, are less likely to be cut back or eradicated by property owners and/or municipalities. Creek Segments B, C, D and E are bordered by developed or agricultural land or undeveloped land which is mowed to control weeds (as required by local ordinance); and

- Sediment removal in CS-B, C, D and E was performed within the creek channel with minimal disturbance to top of bank areas. Planting trees and shrubs in the channel is not considered appropriate for the reasons discussed below.

Equipment used to perform the sediment removal action in CS-B, C, D and E was confined to the creek channel except for six entry/exit points. Trackhoes, used to remove impacted sediment and load it into articulated haul trucks, worked within the channel. Haul trucks drove on plank roads within the channel until they reached an entry/exit point where they traversed the top of bank area to reach a paved road.

It is inappropriate to plant trees or shrubs in the channel of Dead Creek since they will reduce the channel section, impede downstream flow and increase the potential for flooding in residential and commercial areas. Re-establishment of tress and shrubs in the channel is also contrary to the objective of the Dead Creek Culvert Replacement Removal Action. Culverts at Cargill Road and the Terminal Railroad Embankment were replaced, under a UAO, to move water downstream from residential and commercial areas and reduce the threat of flooding.

Trees and shrubs in the channel of Creek Segments B, C, D or E will reduce the flow improvements that resulted from the Culvert Replacement Removal Action.

Entry/exit points in Creek Segments B, C, D and E were located strategically along the channel at road crossings or areas where top of bank disturbance could be minimized. Each entry/exit point is listed below along with the type of land use found in the associated top of bank area:

- Creek Segment B - West Bank 300 ft. North of Judith Land (Grassy Field)
- Creek Segment C - West Bank at Judith Lane (Grassy Area Adjacent to Golf Driving Range)
- Creek Segment D - Kinder Street (Developed Area - Single Family Housing)
- Creek Segment E - East Bank at Edgar Street (Gravel Parking Lot)
  West Bank 100 ft. South of Trailer Park (Agricultural Land)
  East Bank Opposite Apartment Buildings (Grassy Area)

Due to the presence of developed and agricultural land or mowed undeveloped land at each of these entry/exit points, restoration of top of bank areas with trees, shrubs or forbs is not considered appropriate. That said, IDOT Class 5 and 5A forb seed mixes, as modified by USFWS, will be added to the IDOT 4A (Low Profile Native Grass) channel side-slope seed mix proposed in the Mitigation Plan as directed by USACE and USFWS. Revegetation plans also need to take into consideration that vegetation was re-established naturally this spring along most, if not all, of the Dead Creek channel.

Creek Segment F

Rather than working in the channel, as was done in CS-B, C, D and E, sediment removal was performed from the bank in four distinct areas of CS-F:

- Route 157 to Route 3 — West Bank Opposite Cahokia Sign - Grassy Field
- Route 3 to Cargill Road — West Bank at Abundant Love Church - Parking Lot
- Cargill Road to the Terminal Railroad — West Bank - Grassy Field
- Terminal Railroad to Borrow Pit Lake — East Bank - Undeveloped Wooded Area

Planting trees, shrubs and forbs in the top of bank areas between Route 157 and the Terminal Railroad Embankment is not appropriate because such plantings would conflict with current land use.

Approximately 12 to 15 entry/exit points were necessary to perform the Sediment Removal Action in Creek Segment F downstream of the Terminal Railroad Embankment because of the length of this creek segment (approximately 4500 ft.). Entry/exit points to the creek channel, constructed every 100 to 150 ft., were made without cutting trees. However, 20 to 25 ft. of underbrush was removed at each entry/exit point in order to gain access to the channel. Dead trees in the channel were removed and used to create brush pile habitats along the border between the wooded area along Creek Segment F and the adjacent farm fields.

Given the undeveloped, wooded nature of the top of bank area along Creek Segment F from the Terminal Railroad Embankment to the Borrow Pit Lake and the brush that was removed to gain access for the Sediment Removal Action, it is appropriate to plant shrubs (e.g. Winterberry, Silky Dogwood and Buttonbush) in the disturbed upland areas of this portion of the creek segment.

Planting forbs in the channel bottom and sides slopes in the undeveloped, wooded portions of Creek Segment F downstream of the Terminal Railroad Embankment is contrary to the concept of restoring the creek channel to its likely original habitat - prairie and savannah. Since this undeveloped area is currently wooded, it is appropriate to add IDOT Class 5 and 5A forb seed mixes, as modified by USFWS, to the IDOT 4A (Low Profile Native Grass) channel side-slope seed mix proposed in the Mitigation Plan.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

2. Neither Section 2.0 nor Appendix 1 provides any context or perspective with which to evaluate the results of the baseline habitat assessment. Please add some conclusions regarding the overall habitat value of Dead Creek and Borrow Pit Lake (BPL) in both a local and regional context.

Response: The Time-Critical Sediment Removal Action UAO did not specify the type or duration of baseline habitat assessment that needed to be performed. All that the Order required was that "Sixty days after the completion of the sediment and soils removal activities required by this Order, Respondents shall submit to EPA a Mitigation Plan which .... shall provide an accounting of all wetlands and habitat adversely affected by the project".

The Baseline Habitat Assessment included in the Mitigation Plan was performed to partially address this requirement of the UAO. To fully-address the requirement, a post-removal assessment needs to be performed. Performance of the Post-Removal Habitat Assessment is on hold pending USEPA review of the Dead Creek Final Remedy Engineering Evaluation/Cost Analysis submitted on June 21, 2002.

Placing the Baseline Habitat Assessment in a local and regional context and evaluating the overall habitat value of Dead Creek and the Borrow Pit Lake were not required by the UAO. However, this information was collected for performance of the Sauget Area 1 Ecological Risk Assessment and will be incorporated into the Mitigation Plan as indicated in the Response to Comment No. 7 below.

3. For the BPL investigation, the focus on mercury toxicity to fish rather than on bioaccumulation is not appropriate. Sediment results and fish tissue results for mercury are above the threshold values considered to pose food chain risks.

Response: Please see the Response to Comment Nos. 12, 13, 15 and 17.

Specific Comments

4. **Page 2-1, Section 2.0, Second paragraph, Second and Fourth Sentences:** The words "portions" and "sections" in these two sentences need to be quantified to provide a perspective on the overall habitat value of Dead Creek.

Response:

"Portions" - Land uses in the top of bank areas along Dead Creek are summarized below:

Segment	East Bank			West Bank		
CS-B	Industrial	620 ft.	32.6 %	Undeveloped	1,140 ft.	62.6 %
	Agricultural	740 ft.	38.9 %	Agricultural	680 ft.	37.4 %
	Undeveloped	380 ft.	20.1 %	**Total**	1,820 ft.	100.0 %
	Residential	160 ft.	8.4 %			
	Total	1,900 ft.	100.0 %			
CS-C	Residential	360 ft	24.0 %	Recreational	300 ft.	19.4 %
	Undeveloped	600 ft.	40.0 %	Residential	740 ft.	48.1 %
	Residential	540 ft.	36.0 %	Recreational	360 ft.	23.4 %
	Total	1,500 ft.	100.0 %	Residential	140 ft.	9.1 %
				Total	1,540 ft.	100.0 %
CS-D	Residential	920 ft.	100.0 %	Residential	800 ft.	88.9 %
	Total	920 ft.	100.0 %	Commercial	100 ft.	11.1 %
				Total	900 ft.	100.0 %
CS-E	Residential	100 ft.	2.7%	Institutional	120 ft.	3.3 %

Undeveloped	640 ft.	17.1 %	Residential	480 ft.	12.9 %
Institutional	380 ft.	10.2 %	Undeveloped	600 ft.	16.1 %
Residential	240 ft.	6.4 %	Residential	760 ft.	20.2 %
Commercial	60 ft.	1.6 %	Undeveloped	420 ft.	11.3 %
Residential	510 ft.	13.6 %	Institutional	900 ft.	23.9 %
Commercial	70 ft.	1.9 %	Residential	480 ft.	12.3 %
Agricultural	160 ft.	4.2 %	**Total**	3,760 ft.	100.0 %
Institutional	1580 ft.	42.3 %			
Total	3,740 ft.	100.0 %			

Creek Segment F, between Cargill Road and the Borrow Pit Lake is a 350 ft. wide undeveloped area bounded by agricultural areas on both sides of the channel.

Habitats in the Dead Creek Baseline Habitat Assessment study area breakdown as follows:

• Forests	8.2 Acres	47.4 %
• Shrublands	0.1 Acres	0.6 %
• Herbaceous Alliances	2.2 Acres	12.7 %
• Wetlands	3.2 Acres	18.5%
• Open Water	3.6 Acres	20.8 %
Total	17.3 Acres	100.0 %

"Sections" - Two rare species, specifically the Brown Creeper (a bird) and Early Wild-rye (a grass), were observed in Dead Creek Segments B and C, respectively.

Brown Creeper (Serthia americana) singing was heard on November 8, 1999 in Creek Segment B. This area possessed a few, very large diameter, dead, standing trees which provide habitat for this bird. It is likely that Brown Creeper use of Dead Creek is minor due to limited intact forest and the young age of most trees.

Early Wild-rye (Elymus macregorii) appears to be rare in Illinois and information on its occurrence in Creek Segment C was included in the Baseline Habitat Assessment in the event it became a state-tracked species. The only occurrence of this grass in the study area was from a Fraxinus pennsylvanian-Ulmus americana Temporarily Flooded Forest in Creek Segment C. It was located on the east bank of Dead Creek, upstream of Cahokia Street within wetland characterization plot C-4. Plants were limited to a small area (7 sq. ft.) and were senescent with dispersing fruits at time of observation (November 1999).

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

5. **Page 2-1, Section 2.0, Third Paragraph:** Please add a new paragraph which identifies the limitations of a four day, late fall field survey and what was done to compensate for not having a field survey in the spring during the flowering, migration, and breeding season.

Response: The Time Critical Sediment Removal Action UAO was issued by the Agency on May 31, 2000. Since this was a time-critical removal action, work was planned, approved and implemented in an expeditious manner that did not allow for assessment of baseline habitat conditions for a year period prior to implementation of the removal action. On June 30, 2000, the Draft Time Critical Removal Action Work Plan was submitted to the Agency. The Baseline Habitat Assessment was performed in October and November 2000, just before installation of the sediment dewatering system, which began in November 2000 and finished in February 2001. Containment cell construction started in April 2001, when the Work Plan was approved. Sediment removal was started in June 2001 and completed in February 2002.

To compensate for the lack of seasonal, site-specific observations of the extent of migratory bird use during spring and fall migrations, nesting use in summer months, herpetological use in the spring and summer and plant community composition changes throughout the course of the growing season, literature sources were used to provide information on the plant and animal species that were or might be present in the Dead Creek corridor.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

6. **Page 2-2, third paragraph, first sentence:** Please change "come" to "some."

Response: This sentence will be revised as follows:

"Animal use is generally limited to species that do not require large tracts of pristine land and can tolerate some level of habitat modification and disturbance."

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

7. **Page 2-2, last paragraph, second, third and fourth sentences:** Please quantify "for much of the season" in the second sentence and clarify the third and fourth sentences by quantifying the approximate proportion of Dead Creek that is in each category. Finally, please provide conclusions regarding the overall habitat value of Dead Creek, both regionally and locally.

Response:

Dead Creek and Borrow Pit Lake Water Levels

Dead Creek Segments B, C, D, E and F and the Borrow Pit Lake typically fill with water during spring rains. Runoff from spring rains discharging into Dead Creek at road crossings or falling directly on the creek channel fills CS-B, C, D and E. Runoff from the floodplain in Creek Segments C, D and E does not readily reach Dead Creek because the floodplain is lower than the creek or there is little or no natural or engineered drainage to route runoff to the creek. Undersized culverts located above the channel bottom at Judith Lane, Edwards Street, Kinder Street, Jerome Lane, Edgar Street and the Parks College parking lot act as flow constrictions and detain storm water.

Flow is also restricted by the low gradient in Dead Creek. Channel bottom centerline elevation at the low point of Creek Segment B, after completion of sediment removal, was 396.06 while the low point elevation of the channel centerline at the Cottonwood Apartments at the downstream end of Creek Segment E was 395.53 ft. amsl. This is a drop of 0.53 ft. over a distance of approximately 8,000 ft., a gradient of 0.35 feet per mile or 0.007%. A one percent slope is typically the minimum design for channel flow.

Creek Segment F fills with flow from upstream creek segments; runoff from Route 157, Route 3 and Cargill Road; runoff from the Phillips Pipeline property and other areas adjacent to CS-F. When the rise in Mississippi River stage triggers closure of the flap valves discharging water from Dead Creek beneath the levee at Old Prairie du Pont Creek, storm water is detained and accumulates in Creek Segment F and the Borrow Pit Lake. Storm water is also detained in Creek Segment F because the channel bottom elevation at its confluence with the Borrow Pit Lake is four feet lower that the elevation of the bottom of the Borrow Pit Lake (392.08 ft amsl vs. 396.4 ft, respectively). With this elevation differential, the Borrow Pit Lake acts as a dam causing water to backup in the channel portion of CS-F upstream of its confluence with the BPL.

From late summer through winter, Dead Creek and the Borrow Pit Lake are typically drying up or dry, creating intermittent, isolated water bodies. When water levels in Creek Segments B, C, D and E fall below the culvert inverts at Judith Lane, Edwards St., Kinder St., Jerome Lane, Edgar Street and the Parks College parking lot during dry weather conditions, a series of stagnant, discontinuous pools with no flow are created upstream of each road crossing. Pools in Creek Segments B, C, D and E routinely dewater or dry up in warm weather and/or low rainfall periods. Creek Segment F north of the Terminal Railroad embankment dries up also in these weather conditions. CS-F south of the Terminal Railroad embankment dewaters but does not dry up, probably as a result of water flow from the Phillips Pipeline property.

As reported in the June 2001 Sauget Area 1 Ecological Risk Assessment, water levels were extremely low in Dead Creek and the Borrow Pit Lake during the Sauget Area 1 Support Sampling Plan ecological site reconnaissance and sampling in September, October and November 1999. Many areas of these water bodies were dry with exposed mud. Fish and other aquatic organisms (e.g. frogs) were concentrated in shallow puddles. The Borrow Pit Lake was in the last stages of drying up when the Support Sampling Plan fish tissue sampling

was conducted in October and November1999. These low water levels were persistent region-wide.

Observations made in the field in 1999 indicate that the water level in the Borrow Pit Lake and Creek Segment F were low. This may be due to natural fluctuations in water level and may also be linked to the particularly dry growing season in 1999. Dead Creek was a series of small, shallow water bodies of standing water. Examination of the creek bed and riparian vegetation suggests that Dead Creek does not retain substantial amounts of standing water during the summer months and that water levels are dependent on relatively recent precipitation.

A memorandum authored by Bill McClain of the Illinois Department of Conservation (dated July 23, 1992 and received by Tom Crause at the Illinois Department of Natural Resources on July 29, 1992) contains observations of Creek Segments B through F indicating that a low water level is a normal condition in Dead Creek. Historical information from a 1984 survey of the American Bottoms conducted by IEPA and reported in 1989 indicated that 12 out of 14 streams were at low flow conditions in the summer. Historical discharge data for other creeks in St. Clair County, Illinois (Canteen Creek, Mud Creek and Richland Creek) indicates a high variability in discharge over each year. However, for a large portion of each year, discharge is very low, often near zero. Both of these patterns occur each year, suggesting that low to zero flow conditions, as seen in Dead Creek in 1999, are common.

Annual dewatering/desiccation of Dead Creek and the Borrow Pit Lake creates an aquatic habitat that is not conducive to a sustainable fish population. Streams in the mid-American Bottoms basin, in which Dead Creek and the Borrow Pit Lake are located, are considered moderate to limited aquatic resources.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

Local and Regional Habitat Value of Dead Creek

As discussed in the Response to General Comment No. 2, collecting information on the local and regional habitat value of Dead Creek was considered outside the requirements of the Sediment Removal Action UAO. However, this information was collected for performance of the Sauget Area 1 Ecological Risk Assessment and can be incorporated into the Mitigation Plan as indicated below.

Menzie-Cura & Associates made observations of the site in 1966 and the site and reference areas in September, October and November 1999. Information presented here is also based on research on ecological receptors at the site.

Local Habitat

Dead Creek

The Dead Creek channel and riparian communities form a narrow, linear wetland system that passes through suburban Cahokia. Portions of Dead Creek are adjacent to residential and business lots that contain mowed lawns, buildings, driveways and roads. To a great extent, these areas were modified so that only relict portions of natural vegetation alliances exist. Furthermore, many areas are also influenced by non-native plant species. Sections of the creek, however, are used by rare species monitored by the Illinois Endangered Species Protection Board. This illustrates that Dead Creek does possess value for wildlife habitat and as a travel corridor.

Dead Creek's wetlands appeared healthy with no evidence of ecological stress (no chlorotic plants, no monospecific stands of vegetation, no areas of dying or dead vegetation, no observed surface water sheens or sediment staining) with the exception of extremely low water levels observed in Fall 1999, when portions of Dead Creek and the Borrow Pit Lake dried out completely. The wetlands appeared to support a diverse aquatic and terrestrial wildlife community, with abundant prey species (i.e. fish, frogs, turtles) and predatory species (i.e. wading birds, waterfowl, raccoons).

Animal use of Dead Creek is generally limited to species that do not require large tracts of pristine land and can tolerate some level of habitat modification and disturbance. These animals are mostly species that can use residential areas for foraging and/or shelter or are smaller vertebrates that have limited spatial requirements.

Birds - Several species of birds were observed using Dead Creek and the adjacent riparian corridor for foraging an roosting. Many of the birds seen were those that frequent residential areas (e.g. American robin, northern cardinal, blue jay, northern mockingbird) and could use the area of the Dead Creek floodplain for nesting. Carolina wrens, several species of sparrows and Eurasian tree swallows were noted using dense shrub and liana thickets. European starlings were seen roosting in large flocks in the larger tress along Dead Creek. Limited use of the open water sections by waterfowl and wading birds does occur. These open water areas are likely to be used during the breeding season for feeding by swallows, phoebes and flycatchers. On two occasions, a great horned owl was seen in or near the study area.

Two bald eagles, a federal-listed endangered species, were observed by USEPA and IEPA approximately one mile west of Dead Creek Segment B and 0.5 miles east of the Mississippi River in late 1999. A bald eagle was also observed in the same location in December 2000.

Small numbers (one to ten individuals) of state-listed endangered or threatened wading birds were found foraging along sections of Dead Creek. Observed state-listed endangered species included little blue heron (Egretta caerulea), snowy egret (Egretta thula) and black-crowned night heron (Nycticorax ncyticorax). Great egret (Casmerodieu albus), an Illinois threatened species, was also observed.

Mammals - Mammals using Dead Creek habitats were primarily rodents, small omnivores and likely bats and insectivores (i.e. shrews). Eastern chipmunks and gray squirrels were seen frequently during the surveys. Raccoon tracks were found nearly everywhere the ground surface was conducive to track formation. The only large mammal documented in the study area was white-tailed deer. Numerous tracks were observed of this species. USFWS service lists the Indiana bat as a federal endangered species. The Indiana bat requires a habitat of small stream corridors with well-developed riparian woods and nearby upland forest. The wooded areas around Dead Creek and the Borrow Pit Lake are not well developed due to residential and agricultural uses and, therefore, do not provide good habitat for the Indiana bat.

Herptiles - Few amphibians and reptiles, collectively called herpetiles, were observed in the vicinity of Dead Creek. However, the stream channel and adjacent riparian forest provide habitat for a number of species that can occur in small, somewhat disturbed water bodies. Animals that are ubiquitous in many wetland types in the United States, such as bull frogs, northern cricket frogs, painted turtles, red-eared sliders and common garter snakes, are expected to use Dead Creek for feeding and shelter.

Fish - Though Illinois has a rich fish fauna, it was expected that few species would be found in Dead Creek. Due to blocked drainages and elevated culverts, much of the upper Dead Creek functions more as a series of linear, shallow ponds rather than a flowing stream course. Therefore, during much of the year, it would be difficult for fish to move through the watershed to escape declining water levels or other stressful conditions (e.g. high water temperature, low dissolved oxygen, avian predators). Furthermore, Dead Creek generally possessed turbid water and a soft bottom, eliminating species that require clear water and firm substrate. Fish were only observed in Creek Segments B and D during implementation of the Sauget Area 1 Support Sampling Plan. No fish were observed in Creek Segment F.

Borrow Pit Lake

Creek Segment F of Dead Creek flows through riparian woods and shrubs into the southern third of the Borrow Pit Lake, which is the largest non-flowing water body in the area. Its shore is surrounded with mature riparian trees. Based on observations made in September 1999, very little submerged or emergent vegetation appears to grow in the Borrow Pit Lake. In October 1999, water levels were extremely low and sediment was exposed in large portions of the Borrow Pit Lake. Ducks, herons and fish were observed in the lake. Observed fish species included: white crappie, largemouth bass, bluegill sunfish, brown bullhead, yellow bullhead, walleye, drum, silver carp and gar.

Extensive wetlands occur west of Route 3, particularly in the vicinity of the Borrow Pit Lake. These wetlands receive water from both Dead Creek and from drainage areas to the north.

Regional Habitat

Old Prairie du Pont Creek

During high water conditions, Dead Creek flows from the Borrow Pit Lake into the ditched section of Old Prairie du Pont Creek. At the confluence of Dead Creek and Old Prairie du Pont Creek and above it, the ditch shore is vegetated with grasses, herbs and small shrubs. This portion of Old Prairie du Pont Creek is maintained as a storm water drainage ditch routing runoff from this portion of the American Bottoms to the Mississippi River. During high river stage, Old Prairie du Pont Creek becomes a backwater area impounding water between the flood-control levees constructed on both banks.

Habitat in Old Prairie du Pont Creek at East Carondelet, Illinois, approximately 3 miles southwest of the Dead Creek watershed, was evaluated during implementation of the Sauget Area 1 Support Sampling Plan ecological sampling. Here, Old Prairie du Pont Creek is a broad, shallow water body with a mud substrate similar to the Borrow Pit Lake. It is also similar to the Borrow Pit Lake in that it is near agricultural land, it has a narrow riparian zone and it has little to no emergent or submerged vegetation. It supports an aquatic community similar to the Borrow Pit Lake with many of the same species present. Fish species present included brown bullhead, crappie, bluegill sunfish and largemouth bass. Clams and shrimp were the invertebrates present in this stretch of Old Prairie du Pont Creek. Great and snowy egret were observed in this area.

Cahokia Chute and Arsenal Island

Flow in the ditched section of Old Prairie du Pont Creek is northwest to Arsenal Island on the Mississippi River. Arsenal Island contains areas of mature riparian woods and agricultural fields. The shoreline of the lower end of the ditch, referred to as the Cahokia Chute, is lined with riparian woods, principally large cottonwoods and willow. Large catfish, wood ducks, wading birds and turtles were observed in the channel.

Cahokia Chute forms the eastern border of Arsenal Island. The waterway flows north to south, draining the region northeast of the island. During times when the Mississippi River is high, it appears that the river uses the chute channel to flow around Arsenal Island. Therefore, any water from the Dead Creek watershed only flows through the lower half of the Cahokia Chute between the confluence with the ditched Old Prairie du Pont Creek and the Mississippi River.

The remains of a bald eagle nest and congregating wading birds were observed in 1996at the southern tip of Arsenal Island where the Chute flows into the Mississippi River.

In 1993, a pair of bald eagles (the only federal endangered or threatened species in the study area) unsuccessfully attempted to nest at the southern end of Arsenal Island where the ditched portion of Old Prairie du Pont Creek enters the Mississippi River. The pair was apparently scared off the site based on the unsuccessful nesting attempt. The next year the pair returned to the island, but no monitoring was conducted to determine if they successfully nested. The nest has since blown down and no other nests were constructed on the island.

No wading bird colonies are located within the study area. Small numbers (one to ten individuals) of state-listed endangered or threatened wading birds were found foraging along the ditched length of Old Prairie du Pont Creek, Cahokia Chute and the Mississippi River. Observed state-listed endangered species included little blue heron (Egretta caerulea), snowy egret (Egretta thula) and black-crowned night heron (Nycticorax ncyticorax). Great egret (Casmerodieu albus), an Illinois threatened species, was also observed. The largest concentration of foraging herons (approximately ten individuals at a location) was observed at the confluence of Dead Creek and the ditched Old Prairie du Pont Creek and where the ditched Old Prairie du Pont Creek flows into the Mississippi River. These areas likely support the best concentration fishing areas for wildlife along the waterways.

East St. Louis

Two 1,000 to 2,000 mixed-species wading bird colonies are located in the region. One of these colonies is located approximately one mile east of Sauget Area 1 near the Alton and Southern rail yards in Alorton. The second colony is located over two miles to the north of Sauget Area 1 at Audubon Avenue and 26th Street in East St. Louis, Illinois. These two colonies contain the only breeding little blue heron and snowy egret in Illinois. In addition, black-crowned night heron, great egret, cattle egret (Bubulcus ibis), great blue heron (Ardea herodias) and green-backed heron (Butorides virescens) nest in these colonies.

In 1988, USFWS collected black-crowned night heron and little blue heron eggs from the Alorton colony for contaminant analysis because the region was heavily industrialized with numerous Superfund sites. PCBS, DDE and metals were detected at varying levels in the wading bird eggs. The observed endangered and threatened wading birds foraged on a wide range of aquatic organisms, such as fish, frogs and crayfish, as well as some terrestrial species such as reptiles and insects. USFWS found that these wading birds foraged over a wide area around East St. Louis. Wetlands in Dead Creek and the Old Prairie du Pont Creek composed a relatively small percentage of the available wetland foraging area in the region.

American Bottoms

Long Slash Creek north of the culvert where Merrimac Road crosses the creek (Reference Area 2-1) is located approximately 20 miles south of the Dead Creek watershed. Habitat in this creek is similar to that in Dead Creek Segments B, C, D and E. It is shallow and muddy with a road crossing and agricultural fields down to the water's edge. There was evidence of beaver activity at the culvert under the road crossing. Biota present included creeping buttercup and snails.

A flooded borrow pit north of Fountain Creek was also evaluated as part of the Sauget Area 1 Support Sampling Plan (Reference Area 2-2). This water body, approximately 20 miles south of Dead Creek, had a muddy substrate and a fish and invertebrate community similar to the Borrow Pit Lake. Vegetation surrounding this flooded borrow pit consisted of a thin riparian zone

Observations

- Dead Creek and adjacent riparian communities form a narrow, linear wetland system with value for wildlife habitat and as a travel corridor. Examination of creek bed and riparian vegetation suggests that Dead Creek does not retain substantial amounts of standing water during the summer months and that water levels are dependent on relatively recent precipitation. Streams in the middle portion of the Americans Bottom Basin, in which the Dead Creek watershed is located, are considered moderate to limited aquatic resources. 12 out of 14 streams in the American Bottoms area surveyed by IEPA in 1984 were in low flow conditions during the summer with low to extremely low dissolved oxygen concentrations. Stream flow records for Canteen Creek, Mud Creek and Richland Creek, all of which are located in St. Clair County, Illinois, indicate that discharge is low, often near zero, for a large portion of each year.

- Much of Dead Creek (Creek Segments B, C, D and E and the upstream portion of Creek Segment F) flows through suburban Cahokia, Illinois adjacent to residential and business lots that contain mowed lawns, buildings, driveways and roads. Relict portions of natural vegetation alliances occur in the developed stretch of Dead Creek (Creek Segments B, C, D and E and the upstream portion of Creek Segment F). However, there is sufficient natural riparian vegetation to support local aquatic and terrestrial communities

- The Dead Creek watershed supports a diverse plant community although many areas are influenced by non-native plant species. Forest, shrubland and open water in Dead Creek watershed provide some landscape diversity, however, the early age of most of the communities (due to disturbance) provides limited structural diversity.

- The Dead Creek watershed supports a diverse animal community although animal use is generally limited to species that do not require large tracts of pristine land and can tolerate some level of habitat modification and disturbance.

- Birds and wildlife species are abundant in the Dead Creek watershed and making use of the habitat, which is also used by rare (brown creeper), threatened (great egret) and endangered (little blue herons, black-crowned night herons and snowy egrets) species. Use of Dead Creek by rare bird species is minor due to limited intact forest and the young age of most trees. Endangered bird species forage over a wide area with the Dead Creek watershed forming only a small part of their availability feeding territory.

- Few fish species were found in Dead Creek Segments B, C, D, E and the channel portion of Creek Segment F because blocked drainages and elevated culverts create a series of linear, disconnected, shallow ponds that make it difficult for fish to move through the watershed to escape declining water levels, high water temperature, low dissolved oxygen, avian predators or other stressful conditions.

- A variety of fish species were present in the Borrow Pit Lake, which is the largest non-flowing water body in the area. Fish probably enter the Borrow Pit Lake in the spring during high water stage in the Mississippi River before the river stage is high enough to close the flap valves on the pipes beneath the levee at Old Prairie du Pont Creek. During dry weather conditions, water levels in the Borrow Pit Lake are low with large areas of exposed sediment.

- Ecological stresses observed in the Dead Creek watershed, namely lack of submerged or emergent vegetation and impaired benthic community, are due to poor habitat conditions including low water levels, silty substrate and low dissolved oxygen concentrations. No other evidence of ecological stress was evident in the Dead Creek watershed.

- Moderate to limited aquatic resources, similar to the stream portion of Dead Creek, occur regionally in the American Bottoms, e.g. Old Prairie du Pont Creek, Long Slash Creek and Fountain Creek. Habitats similar to the Borrow Pit Lake also occur regionally in the American Bottoms, e.g. the Fountain Creek borrow-pit lake. Better habitats than Dead Creek and the Borrow Pit Lake are also present regionally, e.g. Cahokia Chute and Arsenal Island and the wading-bird rookeries in Alorton and East St. Louis.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

8. Page 2-3, first paragraph, last sentence: Please change "rate" to "rare".

Response: This sentence will be revised to read as shown below:

"Dead Creek, nonetheless, plays an important role in the local storm water flow, is a wildlife travel corridor and is utilized by rare and uncommon plant and animal species."

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

9. **Section 3.0, Creek Channel Mitigation Plan, General** - The possibility of lining portions of Dead Creek, especially Segment B, has been discussed in recent conference calls between the agencies and the PRPs. If sections of Dead Creek are lined, the creek channel mitigation plan will likely need to be modified to provide appropriate surface cover for the liner. The vegetation mix should also be re-assessed in this case to evaluate potential for root penetration of the liner system.

Response: One of the two remedial alternatives considered in the June 21, 2002 Dead Creek Final Remedy Engineering Evaluation/Cost Analysis, was containment of creek bottom soils with constituent concentrations above site-specific, risk-based levels by armored impermeable liners. Such liners would be utilized to remediate creek bottom soil in all of Creek Segment B (1,800 linear feet), as required by the Sediment Removal Action UAO, and Creek Segment F from the Terminal Railroad Embankment to a point 800 ft. south of the embankment.

Construction of the armoring system should not require grubbing to remove trees, shrubs, roots and debris from the creek channel, as sediment excavation was recently completed (February 2002). Contouring and/or filling may be conducted in and adjacent to the channel to achieve channel sections and top of bank topography that will facilitate the installation of the armored liner, and that will allow for installation of a stable finished cap. Armored liners will consist of four components listed below from bottom to the top of the liner system:

- Base Geotextile;
- 40-mil HDPE Liner;
- Covering Geotextile; and
- Riprap

Installation of soil in the interstices of the riprap and revegetation is not part of this design but could be included given the low gradient/low energy environment found in Dead Creek. If this were done, root penetration of the HDPE liner is highly unlikely unless the membrane is damaged during or after installation. Installation of a base geotextile below the HDPE liner and a covering geotextile on top of the HDPE lining, and placement of riprap in such a manner as to not damage the membrane, will prevent liner damage and eliminate the potential for root penetration.

As an alternative to riprap armoring in Creek Segment B, 3 ft. of well-graded crushed rock ("dense grade") could be placed on top of the cover geotextile, a geotextile could be placed on top of the dense grade to act as a marker layer for the membrane liner and a vegetative growth

layer could be placed on top of the geotextile. Channel bottom and side slopes could then be seeded with the seed mix proposed in the revised Mitigation Plan.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

10. **Page 3-1, Third Paragraph:** It is clear from the baseline habitat survey that forbs and shrubs are an important part of the overall habitat structure of the riparian community. What is not clear is the extent to which forbs and shrubs were removed during sediment removal, since the focus of the discussion in Section 1.0 is trees. Therefore, the appropriateness of simply planting grasses to "provide for the replacement of all habitat and wetlands ... lost in the implementation of the project" is not clear.

    At a minimum, this paragraph needs to present something other than a goal of returning to pre-development prairie. Specifically, there needs to be a link between current and potential habitat value, using the species list from the baseline habitat survey and their habitat requirements. Currently, it appears that replacement of forbs, shrubs, and perhaps some trees should be considered.

Response: See Response to Comment No. 1.

11. **Section 4.0, Borrow Pit Lake Investigation and Mitigation Plan, General** - Rationale should be provided for not collecting, or attempting to collect, fish samples. Results from additional fish samples would serve to more conclusively resolve issues regarding potential analytes of concern and the impacts on fish populations and higher trophic levels.

Response: Fish sampling was performed in the Borrow Pit Lake during implementation of the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan in October and November 1999. During the two sampling episodes, a total of twelve composite fish tissue samples were collected at three locations in the Borrow Pit Lake:

- Predator Fish — 3 Composite Samples - Whole Body
  3 Composite Samples - Fillets
- Forage Fish — 3 Composite Samples - Whole Body
- Bottom Feeder Fish — 3 Composite Samples - Whole Body

Each composite fish tissue sample was analyzed for SVOCs, Pesticides, Herbicides, PCBs, Dioxin and Metals.

Additional fish tissue sampling and analysis in the Borrow Pit Lake is not considered necessary for the following reasons:

1) The existing fish tissue database, which represents three trophic levels of fish (bottom feeder, forager and predator) collected across the entire Borrow Lake, may provide enough high-quality data to allow assessment of ecological impacts associated with mercury. What definitely needs to be augmented is data on the distribution and speciation of mercury in Borrow Pit Lake sediments. Such additional data will help resolve the issue of impacts on fish populations and piscivorous birds due to the presence of mercury in the Borrow Pit Lake;

2) Fish tissue sampling in the Borrow Pit Lake is difficult because the Metro East Sanitary District uses the BPL as a storm-water detention basin. When water levels in the Mississippi River and Old Prairie du Pont Creek are high, flap valves on the discharge pipes that conduct flow from Dead Creek beneath the levee close. Storm-water flow from Dead Creek is detained in the Borrow Pit Lake and allowed to backup until the water level reaches Elevation 10 ft. (local datum). This results in an impounded water depth of 6 to 7 feet at the downstream end of the BPL. When the BPL water level reaches EL 10 ft., the lift station pumps are turned on and water is pumped over the levee and into Old Prairie du Pont Creek. Operating the Borrow Pit Lake as a storm-water detention basin creates an aquatic habitat that is not conducive to producing a sustainable fish population; and

3) Fish present in the Borrow Pit Lake and Dead Creek probably enter these intermittent water bodies in the spring when water levels in Old Prairie du Pont Creek are high, but not high enough to close the flap valves on the pipes conducting flow beneath the levee, and when the culverts at the Terminal Railroad Embankment, Cargill Road, Old Route 3, Route 3, Route 157, Parks College parking lot, Edgar Street, Jerome Lane, Kinder Street, Edwards Street and Judith Lane are submerged. When water levels in Creek Segments B, C, D and E fall below the culvert inverts at Judith Lane, Edwards St., Kinder St., Jerome Lane, Edgar Street and the Parks College parking lot during dry weather conditions, a series of stagnant, discontinuous pools with no flow are created upstream of each road crossing. Pools in Creek Segments B, C, D and E routinely dewater or dry up in warm weather and/or low rainfall periods. The BPL was in the last stages of drying up when the Support Sampling Plan fish tissue sampling was conducted in October and November1999. Dead Creek and the Borrow Pit Lake are intermittent water bodies that are typically drying up or dry from late summer through winter. Annual dewatering/desiccation of Dead Creek and the BPL creates an aquatic habitat that is not conducive to a sustainable fish population.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

12. **Page 4-1, First Paragraph:** Three fish samples and three sediment samples collected during the ecological risk assessment fieldwork do not provide sufficient statistical power to draw conclusions regarding the distribution of mercury throughout a lake one mile in

length. In addition, sediment results and fish tissue results for mercury are above the values considered to pose ecological food chain risks. Non-quantitative adjectives such as "only" (i.e. "Only one of three forage fish samples from the Borrow Pit Lake had mercury concentrations above a threshold level...") should be deleted from the discussion.

Response: The First Paragraph of Section 4.0, Page 4-1, will be modified as follows:

"When USEPA approved the Sauget Area 1 Support Sampling Plan, Human Health Risk Assessment Work, Ecological Risk Assessment Work Plan and RI/FS Work Plan on September 9, 1999, it accepted that the ecological samples collected under these plans would be adequate to perform the Ecological Risk Assessment as approved. Data collected in Dead Creek, the Borrow Pit Lake, Old Prairie du Pont Creek and Reference Areas 1 and 2 for use in the Sauget Area 1 Ecological Risk Assessment included the following:

Summary of Sauget Area 1 Support Sampling Plan Ecological Sampling

	Sediment Samples			Tissue Samples		
	Industry Specific	Broad Scan	Sediment Bioassays	Fish	Prey	Plants
Dead Creek	97	15	16	2	2	13
Borrow Pit Lake	8	3	3	12	4	NS
Old Prairie du Pont Creek	1	2	2	NS	NS	1
Reference Areas	0	4	2	11	7	1

These data were considered to have sufficient power to assess the risks associated with site-related constituents in Dead Creek and the Borrow Pit Lake (BPL) and to confirm or refute the 1997 Ecology & Environment Preliminary Ecological Risk Assessment which was a screening-level evaluation based on a nine sediment samples (8 samples from Creek Segment F and one sample from the Borrow Pit Lake) collected in one day.

During performance of the Sauget Area 1 Ecological Risk Assessment, mercury was identified as a constituent causing a potentially unacceptable impact to forage fish in the Borrow Pit Lake and birds (Great Blue Heron) feeding on the forage fish. One of 12 composite fish tissue samples from the Borrow Pit Lake had a mercury concentration (0.6 mg/kg) significantly above a threshold level reported in the literature to be harmful to fish (0.25 mg/kg):

Summary of Fish Tissue Mercury Concentrations in the Borrow Pit Lake

	Composite 1	Composite 2	Composite 3
Bottom Feeder Fish (Brown Bullhead - Whole Body)	0.05	0.075	**0.26**
Forage Fish (Whole Body)	0.052	**0.6**	ND (0.1)

Predator Fish			
– **Large Mouth Bass (Whole Body)**	ND (0.016)	0.057	0.064
– **White Crappie (Fillet)**	ND (0.02)	ND (0.01)	0.037

Notes: 1) Concentrations in mg/kg

2) Concentrations greater than literature-based 0.25 mg/kg toxicity level in bold print

Analytical data from twelve fish tissue samples (9 whole body and 3 fillet) collected from three different locations in the Borrow Pit Lake indicate that mercury in Borrow Pit Lake sediments is not widely distributed, not biologically available or both. The Borrow Pit Lake Investigation Plan is designed to collect the information on mercury distribution and bioavailability to verify this observation."

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

13. **Page 4-1, Second Paragraph**: Sediment analytical data from Dead Creek Segments B-E do not provide any information regarding potential mercury "hot spots" in Creek Segment F or the BPL. Sediment results for mercury in both Dead Creek (pre-sediment removal) and Borrow Pit Lake (currently) are above the threshold values considered to pose ecological food chain risks. Please delete the last sentence of this paragraph.

Response: Mercury was selected as a COPC in the 2001 Menzie Cura Sauget Area 1 Ecological Risk Assessment due to exceedance of ecological thresholds and identified as a COC due to toxicity to fish and fish-eating birds. The Borrow Pit Lake Investigation Plan is designed to address three nature and extent of mercury migration issues that were not resolved during implementation of the Sauget Area 1 Ecological Risk Assessment, namely:

1) What is the aerial distribution of mercury in the Borrow Pit Lake downstream of Dead Creek;
2) Where do mercury concentration highs (i.e. "hot spots") occur in the Borrow Pit Lake; and
3) Where do mercury concentrations in Borrow Pit Lake sediments exceed site-specific, risk-based concentrations?

Results obtained during implementation of the Borrow Pit Lake Investigation Plan will be used to determine if mercury is uniformly distributed in the Borrow Pit Lake or if it occurs in "hot spots" (concentration highs). Mercury concentration and speciation data obtained during implementation of Borrow Pit Lake Sampling Plan will also be used, in conjunction with existing Borrow Pit Lake fish tissue data, to establish site-specific, risk-based concentrations for biologically-available mercury and identify those areas, if any, that need to be remediated in order to protect fish or fish-eating birds. Containing or removing "hot spots" (concentration highs) that cause exceedance of site-specific, risk-based levels are appropriate removal/remedial actions in an adversely impacted habitat. Consequently, it is important to

know if mercury is uniformly distributed in the Borrow Pit Lake sediments or if mercury concentration highs ("hot spots") occur.

Evaluating existing data on the nature and extent of mercury in the Dead Creek watershed is a critical component of the design of a sampling plan for the Borrow Pit Lake. It is appropriate to include this evaluation in the Mitigation Plan because it allows assessment of known mercury distribution and how this distribution might reflect mercury distribution in the Borrow Pit Lake. Such distributions need to be taken into consideration in the design of the Borrow Pit Lake sediment-sampling program and in interpretation of the results. For example, if mercury in Creek Segments B, C, D, E or F sediments was wholly, or in part, due to migration from sources in the Dead Creek watershed, there could be "hot spots" in creek channel sediments and, therefore, "hot spots" (concentration highs) in the Borrow Pit Lake at and/or downstream of its confluence with Dead Creek.

Distribution of mercury in Dead Creek and Borrow Pit Lake sediments is discussed below.

Dead Creek - Mercury analytical data is available for sediment samples collected in Dead Creek as part of the Sauget Area 1 Support Sampling Plan. These results are summarized below, by creek segment, with the upstream sample in each segment listed first:

Summary of Pre-Removal Action Mercury Concentrations in Dead Creek Sediments

Creek Segment	Sample 1	Sample 2	Sample 3	Average Concentration
CS-B	0.96	1.5	1.4	1.28
CS-C	0.66	0.64	0.58	0.63
CS-D	0.5	0.42	0.35	0.42
CS-E	0.51	0.3	0.3	0.37
CS-F	0.3	1.1	0.45	0.62

Notes: **1) Concentrations are in mg/kg**

2) Sediment Quality Guidelines Threshold Effects Concentration (TEC) = 0.18 mg/kg

3) Florida Sediment Quality Assessment Guidelines (TEL) = 0.13 mg/kg

4) Ontario Guidelines Lowest Effects Level (LEL) = 0.2 mg/kg

While all of these samples exceed ecological screening levels, none of these data indicate that mercury "hot spots" (concentration highs) are present in Dead Creek sediments. All sediments in Creek Segments B, C, D and E and Creek Segment F between Route 157 and the Borrow Pit Lake were excavated and transported to an on-site containment cell during the Sauget Area 1 Sediment Removal Action.

Borrow Pit Lake - During implementation of the Sauget Area 1 Support Sampling Plan, sediment samples were also collected in the Borrow Pit Lake to determine the impact, if any, of discharges from Dead Creek on the Borrow Pit Lake. If Dead Creek was a migration pathway from source areas in the upstream portion of its watershed to the Borrow Pit Lake, there should be a concentration high where Dead Creek discharges into the Borrow Pit Lake. Sediment deposition typically occurs when a stream enters a lake because water velocity decreases and the energy environment is too low to keep all of the sediments in suspension.

Four broad-scan sediment samples were collected to determine whether or not impacted sediment deposition was occurring at the mouth of Dead Creek, i.e. a concentration high or "hot spot". One sample was collected 3,000 ft. upstream of the confluence of Dead Creek and the Borrow Pit Lake in the backwater area, a second sample was collected 200 ft upstream of the confluence of Dead Creek with the Borrow Pit Lake, a third sample was collected at the mouth of Dead Creek and the fourth sample was collected 200 ft. downstream of the confluence. Mercury analyses from these samples are given below, along with copper and zinc concentrations, metals that are known site-specific constituents:

Summary of Sediment Metal Concentrations at the Confluence of Dead Creek and the Borrow Pit Lake

	Mercury	Copper	Zinc
Backwater of Borrow Pit Lake, 300 ft. Upstream of Confluence	0.091	48	320
200 ft. Upstream of Dead Creek Confluence	0.11	64	36
Mouth of Dead Creek	0.45	240	1,600
200 ft. Downstream of Dead Creek Confluence	0.16	36	250

Note: Concentrations in mg/kg

These data indicate that a metals "hot spot" (concentration high) occurs at the mouth of Dead Creek where the channel portion of Creek Segment F enters the Borrow Pit Lake. All sediments in Creek Segment F between Route 157 and the Borrow Pit Lake (the channel portion of CS-F) were excavated and transported to an on-site containment cell during the Sauget Area 1 Sediment Removal Action.

None of these data indicate there is a mercury concentration high ("hot spot") in the Borrow Pit Lake sediments. From an ecological impact perspective, mercury concentrations in two of the three sediment samples from the Borrow Pit Lake were lower than all three of the threshold values considered to pose ecological food chain risks:

Comparison of Borrow Pit Lake Sediment Concentrations to Mercury Ecological Screening Levers

Borrow Pit Lake Sediment Concentration			Ecological Screening Levels		
Sample 1	Sample 2	Sample 3	TEC	TEL	LEL

0.091	0.11	**0.16**	0.18	0.13	0.2

Notes: **1) Concentrations are in mg/kg**

2) Concentrations higher than screening levels indicated in bold print

3) TEC = Sediment Quality Guidelines Threshold Effects Concentration

4) TEL = Florida Sediment Quality Assessment Guidelines

5) LEL = Ontario Guidelines Lowest Effects Level

One of the three Borrow Pit Lake sediment samples exceeded the lowest of the three ecological screening levels by 0.03 mg/kg.

Additional sampling, as described in Borrow Pit Lake Investigation Plan, is needed to determine the aerial distribution of mercury in the Borrow Pit Lake downstream of Dead Creek; to confirm or refute the observation that mercury concentration highs (i.e. "hot spots") do not occur in the Borrow Pit Lake; to provide the data that will allow site-specific, risk-based concentrations to be established for biologically-available mercury in Borrow Pit Lake sediments and to identify locations in the Borrow Pit Lake where sediments exceed RBLs and removal action is appropriate.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

14. **Page 4-2, Section 4.1, Borrow Pit Lake Investigation Plan, Number of Samples:** One sample collected previously in the area of the BPL generally upstream of the confluence with Dead Creek does not provide sufficient data to determine that "backwater deposition of site-related constituents is not occurring in the BPL upstream of its confluence with Dead Creek." Data summarized on page 4-2 does indicate some elevated concentrations of site-related constituents, as the text in the first paragraph of this section describes. Sediment samples should be collected from the area of the BPL upstream of the confluence with Dead Creek. Sample spacing in this area could be increased compared to the 200-foot spacing planned for the area downstream of the confluence with Dead Creek.

Response: Evidence collected during implementation of the Support Sampling Plan supports the conclusion that industry-specific constituents were not deposited in the backwater portions of the Borrow Pit Lake upstream of the point where Dead Creek Segment F discharges into it. This conclusion is not based on one sample in the backwater area but on eight samples in the backwater area specifically collected with the intent of determining whether or not backwater deposition occurred in that portion of the Borrow Pit Lake upstream of Dead Creek. Sufficient sampling was done during implementation of the Sauget Area 1 Support Sampling Plan to make this determination. Additional sampling is not considered appropriate.

Observed distribution patterns of PCBs, TPH, Copper and Zinc, based on eight (8) samples in the Borrow Pit Lake upstream of the confluence of Dead Creek with the Borrow Pit Lake, nineteen (19) samples in Dead Creek immediately upstream of its confluence with the BPL and eleven (11) samples in the BPL downstream of the confluence with Dead Creek, indicate that backwater deposition of industry-specific constituents did not occur in the portions of the Borrow Pit Lake upstream of the confluence with Dead Creek. These constituents were selected to be indicative of the constituents released or potentially released in the upstream portions of the Dead Creek watershed. On September 9, 1999, USEPA approved their selection as indicator parameters when it approved the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan. The Agency also approved the sampling rationale and number of samples (8) selected to determine whether or not backwater deposition was occurring in the Borrow Pit Lake upstream of the confluence with Dead Creek.

Eight samples were collected upgradient of the confluence, spaced every 400 ft. from the north end of the Borrow Pit Lake, and analyzed for PCBs, TPH, Copper and Zinc. These data are adequate to demonstrate the lack of backwater effects. For example, PCB concentrations ranged from ND to 6,290 ug/kg in Dead Creek upstream of the confluence of Dead Creek and the Borrow Pit Lake, were ND in the Borrow Pit Lake upstream of the Dead Creek confluence and ranged from 10 to 390 ug/kg downstream of the confluence. The highest observed PCB concentration downstream of the confluence, 390 ug/kg, was observed in the lift station sump at the Old Prairie du Pont Creek levee. Other than the one "hot spot" concentration of 390 ug/kg in the lift station sump, PCB concentrations downstream of the Dead Creek confluence were ND in 9 out of the 10 samples and 10 ug/kg in the tenth sample.

As can be seen from the analytical data presented below, this distribution pattern is repeated for Total Petroleum Hydrocarbons, Copper and Zinc:

Sample Number	PCBs (ug/kg)	TPH (mg/kg)	Copper (mg/kg)	Zinc (mg/kg)
Upstream of Confluence				
FASED-BPL-S1-0-10IN	ND (99.4)	23	9.9	380
FASED-BPL-S2-0-10IN	ND (109.3)	10	15	230
FASED-BPL-S3-0-8IN	ND (121.8)	4.6	14	300
FASED-BPL-S4-0-10IN	ND (109.9)	4	13	360
FASED-BPL-S5-0-9IN	ND (109.0)	6.6	13	280
FASED-BPL-S6-0-11IN	ND (119.5)	8.1	15	220
FASED-BPL-S7-0-9IN	ND (109.9)	4.3	18	410
FASED-BPL-S8-0-9IN	ND (119.5)	5.5	21	490
Creek Segment F Downstream of Cargill Road				
FASED-CSF-S31N-0-13IN	ND (2,770)	49	130	2,400
FASED-CSF-S30N-0-8IN	35	20	54	850

FASED-CSF-S29W-0-10IN	ND (121.8)	21	26	510
FASED-CSF-S28-0-10IN	6,290	220	1,200	3,200
FASED-CSF-S27E-0-16IN	1,850	44	1,900	6,200
FASED-CSF-S26W-0-13IN	573	75	930	4,700
FASED-CSF-S25E-0-10IN	1,046	71	2,500	6,200
FASED-CSF-S24W-0-13IN	192	47	530	3,200
FASED-CSF-S23-0-16IN	1,397	49	1,400	5,400
FASED-CSF-S22-0-20IN	1,095.2	50	420	4,800
FASED-CSF-S21-0-21IN	523	87	920	4,500
FASED-CSF-S20-0-12IN	456	50	710	2,300
FASED-CSF-S19-0-13IN	1,242.9	74	5,400	10,000
FASED-CSF-S18E-0-14IN	261	110	1,700	9,100
FASED-CSF-S17W-0-16IN	475	100	1,400	11,000
FASED-CSF-S16-0-20IN	13	18	33	3,900
FASED-CSF-S15W-0-28IN	64	31	430	7,700
FASED-CSF-S14W-0-15IN	437	91	480	3,200
FASED-CSF-S13W-0-15IN	241	77	370	2,100
Downstream of Confluence				
FASED-CSF-S12-0-15IN	ND (139.8)	16	80	680
FASED-CSF-S11W-0-10IN	ND (145.1)	11	88	690
FASED-CSF-S10-0-9IN	ND (124.7)	17	33	250
FASED-CSF-S9-0-11IN	ND (145.1)	24	78	400
FASED-CSF-S8-0-15IN	ND (121.8)	8.6	34	160
FASED-CSF-S7E-0-11IN	ND (115.1)	5.7	21	84
FASED-CSF-S6E-0-10IN	ND (118.9)	3.4	17	85
FASED-CSF-S5W-0-10IN	10	3	13	62
FASED-CSF-S4-0-7IN	ND (109.9)	2.7	10	50
FASED-CSF-S3E-0-6IN	ND (112.2)	3.8	17	63
FASED-CSF-S2-0-7IN	390	920	12	53

Data from 38 sediment samples collected in Creek Segment F down stream of the Terminal Railroad Embankment and the Borrow Pit Lake during implementation of the Sauget Area 1 Support Sampling Plan and presented above, indicate that constituents migrating via the surface water pathway in Dead Creek were not deposited in the backwater portions of the Borrow Pit Lake. Therefore, additional sampling in this area is not considered appropriate.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

15.1 Page 4-2, Section 4.1, Analytes: The Ecological Risk Assessment for Sauget Area 1 prepared by Menzie-Cura & Associates (Menzie-Cura, June 30, 2001) indicates that a number of analytes in addition to mercury may be of concern in BPL sediments. On page 3 of the Menzie-Cura (2001) report, they report that the previous screening ecological risk assessment performed in 1997 concluded that some metals, PCBs, PAHs, and dioxin concentrations in sediment were above ecological screening levels. Three samples collected from the BPL do not provide sufficient statistical power to disprove the conclusions from the previous screening ecological risk assessment.

Response:

E&E Preliminary Ecological Risk Assessment - Ecology and Environment performed a "Preliminary Ecological Risk Assessment for Sauget Area 1, Creek Segment F, Sauget, St. Clair County, Illinois (TDD: S05-9703-012, PAN: 7M1201SI)" for USEPA on August 31, 1997. The objective of the report was "to determine whether the site poses no immediate or long-term ecological risk or if a potential ecological risk exists and further evaluation is necessary". On April 18, 1997, E&E (D. Sinars and D. Robin) conducted a site investigation with USEPA (S. Bories, L. Evison and J. Chapman) and IEPA (P. Takacs).

As described in this report, Dead Creek Segment F is a wooded corridor ranging in width from approximately 20 to 100 feet with a predominantly cottonwood overstory. Trees form a mostly closed canopy over the upstream portion but Dead Creek broadened downstream so that the canopy covered only the bank. Vegetation was of low floristic quality, consisting primarily of invasive and pioneer plants, consistent with drainage of wetlands and clearing of woods in the 1930s and the highly disturbed surrounding agricultural and industrial land. However, the creek did provide good quality wildlife habitat as evidenced by the presence of the Black-Crowned Night Heron, a state-listed endangered species. Plentiful detrital inputs (twigs, bark and leaf litter) to the creek provided substantial food base to benthic invertebrates. Lack of riffle areas and, therefore, a potential for periods of low dissolved oxygen levels was noted as one limitation on benthic invertebrate populations.

During this one-day investigation, eight sediment samples were collected at the following locations:

Summary of 1997 E&E Preliminary Ecological Risk Assessment Sediment Sampling Locations

Upstream Sediment Samples

- F107 Borrow Pit Lake Backwater, Upstream of Confluence with Dead Creek
- F106 Ponded Area Downstream of Cargill Road and Phillips Pipeline Company

CS-F Channel Sediment Samples (Cargill Road to Borrow Pit Lake)

- F105 Dead Creek Channel Immediately Downstream of Terminal Railroad Embankment
- F101 Dead Creek Channel South of "Dog Leg" Turn

- F102 Dead Creek Channel Halfway to Confluence with Borrow Pit Lake
- F103 Dead Creek Channel Upstream of Confluence with Borrow Pit Lake
- F104 Dead Creek Channel at Confluence with Borrow Pit Lake

Downstream Sediment Samples

- F108/109 Borrow Pit Lake Downstream of Confluence with Dead Creek

Note: Sample F109 was a duplicate of Sample F108

Since the sample location map included in the E&E report was not drawn to scale, these sample locations are approximate.

Sediment samples consisted of two or three composites at each sampling location. The first aliquot of each composite was collected in the deepest portion of the channel. One or two additional aliquots were collected in suspected depositional areas in other portions of the channel at that sampling location. Samples were analyzed for Metals, PCBs, PAHs, Pesticides, TOC and Dioxin. Due to resource limitations, not every parameter was analyzed for every sample.

E&E performed the screening-level ecological impact assessment "with the following conservative assumptions:

1) The Area Use Factor is 100%: the organism spends all of its time in the contaminated area, so is constantly exposed;
2) Bioavailability is 100%: Conditions do not limit the uptake or adsorption of the contaminant;
3) The most sensitive life stage is present (e.g. early stage); and
4) Species feed entirely on the most contaminated dietary option.

Because this is a screening-level ecological risk assessment, uncertainty is intentionally assumed to be the worst-case scenario in order not to miss contamination that might be present."

Since the primary goal of the investigation was to screen for human health and ecological risk, maximum detected concentrations were used in the assessments. Results indicated that "maximum detections for all of the contaminants are below the human-health based risk values" and that "human health is not severely at risk".

When compared to ecological screening criteria, E&E reported that the data suggested "contamination is a problem". Specifically,

"The metals data indicate that severe contamination exists from arsenic and cadmium (SEL HQs greater than 1) and minor pollution from chromium, lead and mercury. All nine samples exceeded the SEL for arsenic (144 to 276 parts per million [ppm]), including the background, which had the lowest level (144 ppm). Three samples exceeded the LEL for cadmium, one of which exceeded the SEL. The other samples, including the background, were "non detect" for cadmium.

Three samples contained PCB Aroclor-1254, all of which were between the LEL and SEL. Only one sample (F105) contained PAHs. The four PAHs detected were similar to the LEL, but far below the SEL. The maximum concentration of dioxin detected exceeded the high risk concentration for both birds and mammals. In addition, pesticides were not detected above background in any sample.

Sample F104 contained the highest metal concentrations; sample F102 contained the highest PCB and dioxin concentration; and sample F105 was the only sample to contain PAHs. The background sample (F107) contained the lowest concentration of each contaminant, except barium. The duplicate samples, F108 and F109, showed very similar results."

The 1997 E&E Preliminary Ecological Risk Assessment did not discuss the areal distribution of analytical data. Five of the eight samples were collected in the channel of Dead Creek upstream of the Borrow Pit Lake. One of the eight samples was collected in a pond south of Cargill Road that discharges into the channel of Dead Creek. Two of the eight samples were collected in the Borrow Pit Lake (F107 and F108/109). One of the Borrow Pit Lake samples was collected upstream of the confluence with Dead Creek and the other sample was collected downstream of the confluence.

An examination of the analytical data, presented below, indicates that impacted sediments were confined to the channel portion of Creek Segment F, which was remediated as part of the Dead Creek Time Critical Sediment Removal Action.

Summary of 1997 E&E Preliminary Ecological Risk Assessment Sediment Analyses

	Upstream of Dead Creek		Dead Creek Channel Upstream of Borrow Pit Lake					Borrow Pit Lake Downstream of Dead Creek
	(BPL)	(CS-F)						
Constituent, mg/kg	F107	F106	F105	F101	F102	F103	F104	F108/9
Arsenic (6.0)	**144**	**160**	**166**	**232**	**187**	**213**	**276**	**199**
Barium (NA)	137	133	116	145	162	179	228	163
Cadmium (0.6)	ND	ND	ND	ND	**4.56**	**8.89**	**16.3**	ND

Chromium (26.1)	10.4	12.1	12.6	**44.2**	**29.0**	**43.8**	**27.2**	14.9
Lead (31.0)	28.2	28.3	**56.2**	**41.2**	**199**	**111**	**124**	**50.2**
Mercury (0.2)	ND	ND	ND	ND	**0.24**	**0.30**	**0.55**	0.12
Aroclor 1254 (0.06)	ND	ND	ND	ND	**2.1**	**0.50**	**0.52**	ND
Benzo(b)fluoranthene (NA)	NS	0.63	NS	NS	NS	NS	NS	NS
Benzo(g,h,I)perylene (0.17)	NS	**0.52**	NS	NS	NS	NS	NS	NS
Fluoranthene (0.75)	NS	0.62	NS	NS	NS	NS	NS	NS
Indeno(1,2,3-c,d)pyrene (0.2)	NS	**0.50**	NS	NS	NS	NS	NS	NS
Dioxin TEQ, ppt (21)	2.29	NS	**53.4**	**211**	11.5	NS	NS	NS

Notes: 1) Sediment LEL concentrations included in the E&E report are included in parentheses adjacent to each constituent and those constituents with concentrations greater than the LEL are high-lighted in bold.

2) LELs are based on concentrations where ecotoxic effects become apparent but the majority of sediment-dwelling organisms are not affected.

Constituent concentrations in the Dead Creek channel between the Terminal Railroad Embankment and the Borrow Pit Lake clearly show a potential for impact across several parameter groups (metals, PCBs and Dioxin TEQs). Data collected during implementation of the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan also indicated that sediments in this stretch of Dead Creek were adversely impacted. All sediments were removed from this portion of Dead Creek, as well as from the channel between Route 3 and the Terminal Railroad Embankment during the Time Critical Sediment Removal Action. Impacted sediments were also removed from Creek Segments B, C, D and E as part of this removal action.

Sediments in the ponded area immediately south of Cargill Road, and the Phillips Pipeline Company facility which discharges surface water into it, exceeded screening levels for Benzo(g,h,i)perylene and Indeno(1,2,3-c,d)pyrene by a factor of 3. This was the only sample analyzed for PAHs. PAH detections in this ponded area are to be expected given its location downstream of a paved, asphalt road with heavy truck traffic to the Cargill bulk grain terminal; Phillips Pipeline Company, a large, bulk petroleum storage and distribution facility built in the 1930s and still active today; and Rogers Cartage, a truck washing facility that operated upstream of Phillips until sometime in the 1970s.

None of the constituents detected in the sediment sample collected in the Borrow Pit Lake backwater upstream of the confluence with Dead Creek exceeded their respective LELs except for Arsenic, which seems uniformly distributed across all of the E&E sampling locations at concentrations higher than its LEL. Lead in the Borrow Pit Lake sediment sample collected downstream of the confluence with Dead Creek exceeded the sediment LEL by a factor of 2 with a detected concentration level of 50.2 mg/kg and an LEL of 31.0 mg/kg.

Sauget Area 1 Ecological Risk Assessment - When USEPA approved the Sauget Area 1 Support Sampling Plan, Human Health Risk Assessment Work, Ecological Risk Assessment

Work Plan and RI/FS Work Plan on September 9, 1999, it accepted that the ecological samples collected under these plans would be adequate to perform the Ecological Risk Assessment as approved. Ecological data collected as part of the Support Sampling Plan included the following samples:

Summary of Sauget Area 1 Support Sampling Plan Ecological Samples

	Sediment Samples		Sediment	Tissue Samples		
	Industry-Specific	Broad-Scan	Bioassays	Fish	Prey	Plants
CS-B	10	3	3	1	1	3
CS-C	12	3	3	NS	1	3
CS-D	9	3	3	1	1	3
CS-E	26	3	3	NS	NS	2
CS-F	40	3	4	NS	NS	2
BPL	8	3	3	9	4	NS
OPDC	1	2	2	NS	NS	1
Reference Areas	0	4	2	11	7	1

Notes: 1) Industry-specific samples were analyzed for PCBs, Total Petroleum Hydrocarbons, Copper and Zinc.

2) Broad-scan samples, which included sediment and tissue samples, were analyzed for VOCs, SVOCs, Pesticides, Herbicides, PCBs, Dioxin, Metals, Mercury and Cyanide.

3) NS indicates that insufficient tissue was available to allow sample collection and analysis.

Data collected as part of the Sauget Area 1 Support Sampling Plan, and evaluated in the Sauget Area 1 Ecological Risk Assessment, support the findings of the E&E Preliminary Risk Assessment. Specifically,

- Sediments in the channel of Dead Creek in Creek Segment F had an adverse ecological impact. These sediments were removed during implementation of the Sauget Area 1 Time Critical Sediment Removal Action to eliminate this impact; and

- Sediments in the Borrow Pit Lake may have an adverse impact due to the presence of a metal (mercury). These sediments need further characterization and assessment to determine actual or potential risks.

The primary difference between the Ecology & Environment Preliminary Risk Assessment and the Menzie-Cura Sauget Area 1 Ecological Risk Assessment, both of which evaluated the same areas (Creek Segment F and the Borrow Pit Lake), is that E&E identified Lead as a Constituent of Potential Concern (COPC) based on exceedance of a screening-level sediment criteria while

Menzie-Cura identified Mercury as a Constituent of Concern (COC) based on the results of a site-specific ecological risk assessment. For this reason, it is considered appropriate to focus on Mercury rather than Lead during the further investigation of Borrow Pit Lake sediments required by the Sediment Removal Action UAO.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

15.2 **Page 4-2, Section 4.1, Analytes:** In addition, analyses of the three sediment samples collected from the BPL to support the Menzie-Cura (2001) report did not have sufficiently low detection limits to compare to appropriate ecological screening levels for several analytes. According to Menzie-Cura (2001, page 37), detection limits for the following analytes exceeded sediment-screening levels in all three samples:

- Total Cyanide;
- 14 PAH Compounds;
- Bis(2-ethylhexyl)phthalate; and
- Hexachlorobenzene

Detection limits for the following analytes exceeded screening criteria in some samples:

- Silver;
- Total PCBs; and
- 10 Pesticide Compounds

The analytes listed above should be included in the BPL sampling and evaluation program. Sample collection, sample handling, and analytical methods should be verified to insure that appropriate detection limits are achieved for all analytes. The problems with detection limits prevent eliminating these compounds from further consideration based on comparison to benchmark screening criteria. The three fish samples and three sediment samples collected to support the Menzie-Cura (2001) ecological risk assessment do not provide sufficient statistical power to eliminate these constituents from further evaluation.

Response: Detection limits are very often higher than ecological screening levels because of the conservative nature of the screening levels and the inability of Agency-approved analytical methods to achieve detection limits equal to or less than the screening levels. Considerable effort was made to achieve the lowest possible detection limits with USEPA-approved analytical methods as described in the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan Quality Assurance Project Plan (which was approved by USEPA on September 9, 1999).

In spite of these efforts, detection limits for some constituents were higher than their ecological screening levels. Constituents with detection limits that exceeded screening levels were retained as Constituents of Potential Concern (COPCs) in the June 2001 Menzie-Cura Sauget Area 1 Ecological Risk Assessment. COPCs selected using the Agency-approved process include Total PCBs, Dioxin TEQs and the following constituents:

SVOCs

- Bis(2-ethylhexyl)phthalate)
- Di-n-butylphthalate
- Diethylphthalate
- Pentachlorophenol

PAHs

- Acenapthalene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Dibenzo(a,h)anthracene
- Fluoranthene
- Indeno(1,2,3-c,d)pyrene

Pesticides

- Aldrin
- delta-BHC
- gamma-BHC
- alpha-Chlordane
- gamma-Chlordane
- Total DDT
- Dieldrin
- Endosulfan I
- Endosulfan II
- Endosulfan Sulfate
- Endrin Aldehyde
- Endrin Ketone
- Heptachlor
- Heptachlor Epoxide
- Methoyxchlor

Herbicides

- 2,4-D
- 2,4-DB
- Dicamba
- Dichloroprop
- MCPA
- MCPP

Metals

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Manganese
- Mercury
- Molybdenum
- Nickel
- Selenium
- Silver
- Vanadium
- Zinc

Inorganics

- Fluoride

Bis(2-ethylhexyl)phthalate, eight PAHs, 15 Pesticides, Total PCBs and Silver were included as COPCs even though detected concentrations exceeded screening levels. Inclusion of constituents on that basis is conservative and standard practice. Six PAHs (Anthracene, Benzo(a)anthracene, Chrysene, Fluorene, Napthalene and Phenanthrene) were not selected as COPCs because they were either not detected or were infrequently detected. PAHs with the greatest potential impact on ecosystems were included in the Sauget Area 1 Ecological Risk Assessment.

In addition, the detection limits achieved during analysis of the Sauget Area 1 Support Sampling Plan sediment samples do not indicate that high concentrations of the non-detect constituents are present. Detection limits for the COPCS that exceeded screening levels in all three Borrow Pit Lake sediment samples are summarized below:

Summary of COPC Detection Limits for Borrow Pit Lake Sediment Samples Exceeding Screening Criteria

PAHs, ug/kg	ESED - S1	ESED - S1FD	ESED - S2	ESED - S3
1) Acenapthene	470 UJ	470 UJ	500 UJ	470 UJ
2) Acenaphthylene	470 UJ	470 UJ	500 UJ	470 UJ
3) Anthracene	470 UJ	470 UJ	500 UJ	470 UJ
4) Benzo(a)anthracene	470 UJ	470 UJ	500 UJ	470 UJ
5) Benzo(a)pyrene	250 UJ	250 UJ	260 UJ	250 UJ
6) Benzo(b)fluoranthene	470 UJ	470 UJ	500 UJ	470 UJ
7) Benzo(g, h, I)perylene	470 UJ	470 UJ	500 UJ	470 UJ
8) Benzo(k)fluoranthene	470 UJ	470 UJ	500 UJ	470 UJ
9) Dibenzo(a,h)anthracene	250 UJ	250 UJ	260 UJ	250 UJ
10) Fluorene	470 UJ	470 UJ	500 UJ	470 UJ
11) Indeno(1,2,3-cd)pyrene	470 UJ	470 UJ	500 UJ	470 UJ
12) Napthalene	470 UJ	470 UJ	500 UJ	470 UJ
13) Phenanthrene	470 UJ	470 UJ	500 UJ	470 UJ
14) Pyrene	470 UJ	470 UJ	500 UJ	470 UJ
Herbicides, ug/kg	**ESED - S1**	**ESED - S1FD**	**ESED - S2**	**ESED - S3**
1) 2,4,5-T	23 UJ	23 UJ	24 UJ	23 UJ
2) 2,4,5-TP (Silvex)	23 UJ	23 UJ	24 UJ	23 UJ
3) 2,4-DB	23 UJ	23 UJ	24 UJ	23 UJ
4) Dalapon	180 UJ	180 UJ	190 UJ	180 UJ
5) Dicamba	55 UJ	55 UJ	58 UJ	56 UJ
6) Dichloroprop	280 UJ	270 UJ	290 UJ	280 UJ
7) Dinoseb	280 UJ	270 UJ	290 UJ	280 UJ
8) MCPA	5500 UJ	5500 UJ	5800 UJ	5600 UJ
9) MCPP	5500 UJ	5500 UJ	5800 UJ	5600 UJ
10) Pentachlorophenol	47 UJ	47 UJ	50 UJ	47 UJ
PCBs, ug/kg	**ESED - S1**	**ESED - S1FD**	**ESED - S2**	**ESED - S3**
Monochlorobiphenyl	46 UJ	9.2 UJ	9.7 UJ	9.2 UJ
Dichlorobiphenyl	46 UJ	9.2 UJ	9.7 UJ	9.2 UJ
Trichlorobiphenyl	46 UJ	9.2 UJ	9.7 UJ	9.2 UJ
Tetrachlorobiphenyl	95 UJ	19 UJ	20 UJ	19 UJ
Pentachlorobiphenyl	95 UJ	19 UJ	20 UJ	19 UJ
Hexachlorobiphenyl	95 UJ	19 UJ	20 UJ	19 UJ
Heptachlorobiphenyl	140 UJ	28 UJ	29 UJ	28 UJ
Octachlorobiphenyl	140 UJ	28 UJ	29 UJ	28 UJ
Nonachlorobiphenyl	230 UJ	46 UJ	49 UJ	46 UJ

Decachlorobiphenyl	230 UJ	46 UJ	49 UJ	46 UJ
SVOCs, ug/kg	**ESED - S1**	**ESED - S1FD**	**ESED - S2**	**ESED - S3**
Bis(2-ethylhexyl)phthalate	470 UJ	470 UJ	500 UJ	470 UJ
Hexachlorobenzene	190 UJ	190 UJ	200 UJ	190 UJ
Inorganics, mg/kg	**ESED - S1**	**ESED - S1FD**	**ESED - S2**	**ESED - S3**
Silver	2.8 UJ	2.8 UJ	0.79 UJ	2.5 UJ
Total Cyanide	1.4 UJ	1.4 UJ	1.5 UJ	1.4 UJ

Based on this information, high detection limits are not masking the presence of constituents that could have an adverse ecological impact. MCPA (2-Methyl-4-Chlorophenoxyacetic Acid) and MCPP (2-Methyl-4-Chlorophenoxypropionic Acid) are the only two constituents with detection limits high enough to indicate that significant concentrations of these two herbicides might be present in Borrow Pit Lake sediments. Sediment screening levels are not available for MCPA and MCPP. For these reasons, it is not appropriate to include SVOCs, Herbicides, PCBs, Metals and Total Cyanide analyses in the further investigation of Borrow Pit Lake sediments required by the Sediment Removal Action UAO. As discussed in the Response to Comment 15.1, it is considered appropriate to focus this investigation on Mercury.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

16. **Page 4-3, Section 4.1, Field Procedures:** The purpose of the planned sampling is to evaluate ecological risk, particularly with respect to exposure to fish. Eighteen inches is too deep for one vertically integrated sample, since most sediment exposure will be from the top six inches. Samples at all locations should be collected from 0 to 6 inches depth. Methylation processes are known to occur in conditions similar to the BPL. Methyl mercury is much more soluble than inorganic or elemental mercury and therefore can contribute to aquatic exposure irrespective of the depth of the sediments. We recommend that additional samples be collected at depths of 6 to 12 inches from half of the sample locations to assess the distribution of all mercury that may result in exposure to fish populations.

Response: The purpose of the proposed Borrow Pit Lake Investigation Plan is to define the areal distribution of mercury in the Borrow Pit Lake downstream of Dead Creek, to identify mercury "hot spots" (concentration highs) that may have an adverse impact on fish present in the Borrow Pit Lake and birds that may prey on those fish and to determine where mercury concentrations in Borrow Pit Lake sediments exceed site-specific, risk-based levels.

To achieve these objectives, the sampling plan will be modified to include sampling at two depths to characterize the sediment profile, which is typically 8 to 15 inches thick. Samples will be collected from 0 to 6 inches at all sampling locations to characterize the biologically active zone. Samples will be collected from 6 to 18 inches at 50 percent of the sampling locations to

characterize the remaining sediment profile. Samples will be analyzed for Total Mercury and Methyl Mercury.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

17.1 Page 4-4, Section 4.2, Borrow Pit Lake Remediation Plan: Despite the title, this section does not provide a plan to remediate the BPL. In any case, a remediation plan for the BPL is premature pending the results of the proposed sediment sampling. The heading should be changed to reflect planned data validation and assessment methodology.

Response: The Sediment Removal Action UAO required preparation of a Mitigation Plan that included a plan for remediation of the Borrow Pit Lake. To comply with the UAO, the Borrow Pit Lake Remediation Plan was included in the Dead Creek Mitigation Plan. Given that additional sampling is needed to identify any mercury "hot spots" that may cause adverse impact on fish in the BPP and piscivorous birds that prey on those fish, all that could be submitted in the Mitigation Plan was a general description of how the data would be used to determine if remedial action was necessary. Changing the heading of this section will result in a Mitigation Plan that does not comply with the requirements of the UAO.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

17.2 Page 4-4, Section 4.2, Borrow Pit Lake Remediation Plan: More detail should be provided regarding proposed data evaluation, especially how "hot spots" will be quantitatively identified. What criteria will be used, how will the modeling be done, and how will the model input parameters be determined?

Response: "Hot spots" will be quantified by contouring the mercury concentration data to determine if there are identifiable areas of higher mercury concentrations or if the mercury is wide spread. Mercury distribution patterns may help determine the source of the mercury. For example, a concentration high at the confluence of the Dead Creek and the Borrow Pit Lake could indicate fluvial deposition from a source along Dead Creek. A concentration gradient from the confluence to the lift station at Old Prairie du Pont Creek could also indicate a source along Dead Creek. A relatively uniform distribution in the BPL could indicate an anthropomorphic source such as atmospheric fall out from coal-fired power plants (air deposition) or background concentrations.

Mercury speciation data from the Borrow Pit Lake Investigation Plan will be used, along with the existing Borrow Pit Lake fish tissue Total Mercury data (9 whole body composites and 3 fillet composites), to determine a mercury uptake factor for fish. This uptake factor would then be

used to calculate a site-specific, risk-based concentration for methyl mercury that is protective of fish and fish-eating birds.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

17.3 Page 4-4, Section 4.2, Borrow Pit Lake Remediation Plan: Please delete the a priori comments on whether there is any risk.

Response: Aquatic impacts due mercury, such as toxicity and/or bioaccumulation, will depend upon the species of mercury present in the ecosystem. If mercury is in the form of Inorganic Mercury, it will not be readily available in the aquatic ecosystem. If it is in the form of Methyl Mercury, it will be readily available. Sediment and biota samples collected during implementation of the Sauget Area 1 Support Sampling Plan were analyzed for Total Mercury, not mercury species. However, comparing Total Mercury concentrations in sediment and biota samples collected during implementation of the Sauget Area 1 Support Sampling Plan allows a preliminary assessment of the bioavailability of mercury in sediments. This assessment is an important component of designing the Borrow Pit Lake Investigation Plan.

Total Mercury concentrations in Sauget Area 1 sediments are summarized below. Data for Creek Segments B, C, D E and F, which represent concentrations in sediments that were removed and transferred to the on-site containment cell during the Time-Critical Sediment Removal Action, are presented in order from upstream (Sample 1) to downstream (Sample 3) as are the Borrow Pit Lake sediment samples:

Summary of Total Mercury Concentrations in Dead Creek, Borrow Pit Lake and Reference Area Sediments

	Sample 1	Sample 2	Sample 3
Creek Segment B	0.96	1.5	1.4
Creek Segment C	0.66	0.64	0.58
Creek Segment D	0.5	0.42	0.35
Creek Segment E	0.51	0.3	0.3
Creek Segment F	0.3	1.1	0.45
Borrow Pit Lake	0.091	0.16	0.11
Reference Area 1	0.042	0.063	NS
Reference Area 2	0.048	0.04	NS

Note: 1) Concentrations in mg/kg

Total Mercury data are also available for creek bottom soil samples collected and analyzed after completion of sediment removal. These data are summarized below with data from Creek Segments B, C, D, E and F listed from upstream to downstream:

Summary of Maximum Total Mercury Concentrations in Dead Creek and Site M Bottom Soils

Transect/ Sample	CS-B	Site M	CS-C	CS-D	CS-E	CS-F
0	0.82	NS	NS	NS	NS	NS
1	0.23	NS	0.046	0.14	0.11	0.12
2	0.24	0.026	0.06	0.11	0.25	0.074
3	0.27	0.061	0.046	0.07	0.11	0.63
4	0.099	0.22	0.13	0.71	0.083	0.038
5	0.054	0.062	0.074	0.065	0.094	0.82
6	0.21	0.05	0.31	0.33	0.25	0.14
7	0.12	0.33	NS	NS	0.12	0.086
8	0.15	0.092	NS	NS	0.34	0.09
9	0.29	0.031	NS	NS	0.6	0.32
10	0.16	0.3	NS	NS	0.6	0.11
11	0.8	NS	NS	NS	0.46	0.093
12	0.84	NS	NS	NS	0.69	0.031
13	0.096	NS	NS	NS	0.84	0.018
14	0.032	NS	NS	NS	0.28	0.32
15	0.064	NS	NS	NS	0.25	0.17
16	0.12	NS	NS	NS	1.6	0.04
17	0.34	NS	NS	NS	0.27	NS
18	0.055	NS	NS	NS	NS	NS

Notes: 1) Concentrations in mg/kg

2) NS = No Sample

Total Mercury was detected in 12 of the 28 tissue samples collected during implementation of the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan. Total Mercury concentrations in whole-body tissue samples collected from CS-B, CS-D, the Borrow Pit Lake, Reference Area 1 and Reference Area 2 during implementation of the Sauget Area 1 Support Sampling Plan are summarized below.

Summary of Toal Mercury Concentrations in Sauget Area 1 Biota (Whole Body) Samples

Sample		CS-B	CS-D	Borrow Pit Lake	Reference Area 1	Reference Area 2
Bottom Feeder Fish	1	NS	NS	0.05	0.1	0.05
	2	NS	NS	0.075	0.086	NS
	3	NS	NS	0.26	NS	NS

Forage Fish	1	ND (0.095)	0.018	0.052	0.05	0.051
	2	NS	NS	0.6	NS	0.064
	3	NS	NS	ND (0.1)	NS	0.046
Predator Fish	1	NS	NS	ND (0.016)	0.097	NS
	2	NS	NS	0.057	0.14	0.1
	3	NS	NS	0.064	NS	NS
Shrimp		NS	NS	ND (0.091)	ND (0.091)	ND (0.083)
Clams	1	NS	NS	ND (0.074)	ND (0.0.95)	ND (0.074)
	2	NS	NS	ND (0.091)	NS	ND (0.077)
	3	NS	NS	ND (0.10)	NS	NS
Snails		ND (0.0.071)	ND (0.077)	NS	ND (0.087)	ND (0.091)

Notes: 1) Concentrations in mg/kg

2) A composite snail sample was also collected in Creek Segment C. Mercury = ND (0.077)

Comparison of average Total Mercury concentrations in Sauget Area 1 sediment and biota samples, using half of the detection limit for non detects, allows an initial assessment of the bioavailability of mercury in sediments. While average Total Mercury concentrations in Creek Segment B and Creek Segment D sediment samples are an order of magnitude higher than average sediment concentrations in the Reference Areas 1 and 2 sediment samples, average biota concentrations are lower (0.035 ppm vs. 0.055 ppm), which indicates that mercury is not bioaccumulating in Creek Segments B and D:

Summary of Average Total Mercury Concentrations in Sauget Area 1 Sediment and Biota Samples

Sample	CS-B	CS-D	Borrow Pit Lake	Reference Area 1	Reference Area 2
Sediment	1.287	0.043	0.120	0.053	0.044
Biota	0.042	0.028	0.127	0.062	0.047

Note: 1) Concentrations in mg/kg

Average Total Mercury concentrations in sediment and biota from the Borrow Pit Lake are essentially the same (0.120 vs. 0.127). Average tissue concentrations are higher in the Borrow Pit Lake than in CS-B, CS-D and the two Reference Areas. This evidence for bioaccumulation depends upon one outlier forage fish tissue concentration of 0.6 ppm. Removing this outlier from the Borrow Pit Lake biota data set results in an average biota mercury concentration of 0.074 ppm in the Borrow Pit Lake, which is an order of magnitude lower than the average Borrow Pit Lake sediment concentration of 0.120 ppm and 0.012 to 0.027 mg/kg higher than fish tissue concentrations in the Reference Areas.

Additional sediment sampling and analysis in the Borrow Pit Lake, as required by the Sediment Removal Action UAO, is needed to determine whether or not bioavailable Mercury is present in these sediments and, if so, where it is located. Incorporation of existing information on the distribution and occurrence of mercury in Dead Creek and the Borrow Pit Lake is critically important to developing a sampling plan that will effectively characterize the distribution of mercury species in the Borrow Pit Lake. Not understanding these data could result in improper sampling plan design, incorrect risk assessment conclusions and inappropriate risk management decisions.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

17.4 Page 4-4, Section 4.2, Borrow Pit Lake Remediation Plan: Perhaps the methodology being proposed for the residual risk assessment of Dead Creek Segments B through E could be extended to this evaluation.

Response: Risks could not be calculated for Total Mercury in creek bottom soils during performance of the Dead Creek Final Remedy Engineering Evaluation/Cost Analysis (submitted to USEPA on June 21, 2002) because mercury concentrations in fish could not be demonstrated to be dependent on sediment concentrations. As a result, site-specific sediment to fish uptake values could not be developed for Total Mercury. Additional data collection is needed to assess the impact associate with the low residual concentrations of Total Mercury found in Borrow Pit Lake sediments.

Given this situation, a three-step action plan is appropriate to identify risks associated with Mercury in the Borrow Pit Lake and any remedial measures that might be needed to mitigate those risks:

1) Collect additional Borrow Pit Lake sediment samples, analyze them for Total Mercury and Methyl Mercury and contour the Total Mercury and Methyl Mercury concentrations to determine if mercury is wide spread, if there are identifiable concentration highs (mercury "hot spots) or both;

2) Compare bioavailable Methyl Mercury concentrations in Borrow Pit Lake sediments to screening criteria such as the Sediment Quality Guidelines (TEC = 0.18 mg/kg), the Florida SQAG (TEL = 0.13 mg/kg) or Ontario Guidelines (LEL = 0.2 mg/kg) to determine whether or not there is a potential for risk; and

3) If there is a potential for risk, based on exceedance of screening-level concentrations, determine a site-specific, risk-based Methyl Mercury concentration that will protect fish and piscivorous birds. The mercury speciation data from the Borrow Pit Lake Investigation Plan would be used, along with the existing Borrow Pit Lake fish tissue Total Mercury data (9

whole body composites and 3 fillet composites), to determine a mercury uptake factor for fish. This uptake factor would then be used to calculate a site-specific, risk-based concentration for methyl mercury that is protective of fish and fish-eating birds, which would be integrated into an EE/CA for the Borrow Pit Lake.

On completion of the mercury risk assessment, an EE/CA can be performed to evaluate remedial alternatives and identify an appropriate remedy.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

U.S. Fish and Wildlife Service

1. More diverse seed mixes should be used along the banks of Dead Creek to provide a diverse plant community. A "grass-only" community will not allow for the introduction of local, native plant species.

Response: See Response to USACE General Comment No. 1.

2. The Draft Plan states that Illinois Department of Transportation (IDOT) Class 4 seed mixes, 4A (Low Profile Native Grass) and 4B (Wetland Grass and Sedge Mixture), will be used for planting. IDOT Class 5 seed mixtures, 5 (Forb with Annuals Mixture) and 5A (Large Flower Native Forb Mixture), should be used in addition to the Class 4 seed mixes in the planting with exception of the following species that are not native to the Mississippi Bottoms:

   Chrysanthemum maxium (Shasta Daisy)
   Gaillardia pulchalle (Blanket Flower)
   Ratibida columnitera (Long-Headed Coneflower)

   In addition, the percentage by weight of Helianthus mollis (Downy Sunflower) should be reduced to 3 % or 5% from the Class 5A seed mixture because of the aggressiveness of this species.

Response: IDOT Class 4B seed mix will be planted in the bottom of the creek channel and the 4A seed mix will be sown on the channel side slopes. It is unclear from this comment if IDOT Class 5 and 5B are to be sown in the channel bottom, channel side slopes or both. Will these seed mixes survive in the channel of an intermittent creek that is typically dry from July to March?

3. Additionally, it was noted that the Baseline Habitat assessment completed by Woodlot and Associates does not provide an accurate or complete assessment of habitat conditions at the site as data collection activity occurred wholly in the late fall of 2000. This sort of assessment should take place over the course of a year at a minimum to determine the extent of migratory bird use during the spring and fall migrations, nesting use in the spring and summer months, herpetological use in the spring and summer, and generally the plant community composition will generally change throughout the course of the growing season.

Response: The Time-Critical Sediment Removal Action UAO did not specify the type or duration of baseline habitat assessment that needed to be performed. All that the Order required was that "Sixty days after the completion of the sediment and soils removal activities required by this Order, Respondents shall submit to EPA a Mitigation Plan which....shall provide an accounting of all wetlands and habitat adversely affected by the project".

The UAO was issued by the Agency on May 31, 2000, the Baseline Habitat Assessment was performed in October 2000, sediment dewatering began in November 2000 and sediment removal was started in April 2001 and completed in February 2002. Since this was at time-critical removal action, work was planned, approved and implemented in an expeditious manner

that did not allow for assessment of baseline habitat conditions for one year prior to implementation of the removal action.

To compensate for the lack of seasonal, site-specific observations of the extent of migratory bird use during spring and fall migrations, nesting use in summer months, herpetological use in the spring and summer and plant community composition changes throughout the course of the growing season, literature sources were used to provide information on the plant and animal species that were or might be present in the Dead Creek corridor.

This response is incorporated in the revised Mitigation Plan included in Attachment 1.

Sauget Area 1, Sauget and Cahokia, Illinois

Dead Creek Sediment Removal Action

Mitigation Plan

July 31, 2002

Submitted To:

U.S. Environmental Protection Agency
Region 5, Chicago, Illinois

Submitted By:

Solutia Inc, St. Louis, Missouri

Appendices

1.0 Introduction

On August 29, 2001, USEPA Region 5 issued an Amended Administrative Order (Docket No. V-W-99-C-554) for a time-critical sediment removal action in Dead Creek, a 3.5-mile long stream located in Sauget and Cahokia, St. Clair County, Illinois. As required by the Order, approximately 46,000 cubic yards of impacted sediment were removed from Creek Segments B, C, D, E and F, Site M and the lift station sump where Dead Creek discharges into Old Prairie du Pont Creek. Excavated sediments were transferred to a RCRA and TSCA-compliant containment cell constructed adjacent to the west bank of Dead Creek Segment B just north of Judith Lane. Sediment transfer was completed in January 2002. A temporary plastic cover was installed in the cell to isolate the impacted sediments from storm water. Storm water falling on the cell was contained and treated using granular activated carbon prior to discharge to Creek Segment B.

In addition to installing the cap on the containment cell, several additional work elements required by Section 3, Work to be Performed, of the Order need to be completed. Remaining work includes Section 3.B.4 Excavated Area Soil Sampling, Section 3.B.5 Excavated Area Bottom Liner Requirements, Section 3.C Mitigation Plan. The first two work elements are underway and will be addressed in a separate document; the third work element is dealt with in this submittal.

Specific requirements of Section 3.C of the Order are:

> "Sixty days after completion of the sediment and soils removal activities required by this Order, Respondent shall submit to EPA a Mitigation Plan which contains a detailed statement describing the steps the Respondents have taken and are taking to ensure that the actions required by this Order are implemented in such a way as to avoid and/or minimize adverse impacts to area wetlands and habitat.
>
> Respondents Mitigation Plan shall also provide for the replacement of all habitat and wetlands unavoidably lost in the implementation of the project. Specifically, Respondents Mitigation Plan shall provide an accounting of all wetlands and habitat adversely affected by the project and specific actions Respondents will take, and an associated schedule, to provide replacement of the value and function associated with lost wetlands and habitat.
>
> The Mitigation Plan shall also include a plan for investigating any potential "hot spots" of contamination found in the Borrow Pit Lake located directly west of

> Creek Segment F. This "hot spot" investigation plan shall also provide for the remediation of those sediments in the Borrow Pit Lake that are found to be acting as a source to further risk to human health and the environment."

To summarize, the Mitigation Plan requires the following plans or reports:

Implementation Mitigation Plan - A plan to avoid and/or minimize adverse impacts to area wetlands and habitat during implementation of the removal action;

Baseline Habitat Assessment - An accounting of all wetlands and habitat adversely affected by the removal action;

Creek Channel Mitigation Plan - A plan to provide replacement of the value and function associated with lost wetlands and habitat; and

Borrow Pit Lake Investigation and Remediation Plan - A plan to identify and remediate any potential "hot spots" in the Borrow Pit Lake located directly west and downstream of Creek Segment F.

Measures to be taken to avoid and/or minimize adverse impacts to wetlands and habitat during implementation of the removal action were described in the June 30, 2000 Time Critical Removal Action Work Plan, Dead Creek Sediment and Soil, Sauget and Cahokia, Illinois submitted to USEPA Region 5 by Solutia Inc. The Baseline Habitat Assessment, Creek Channel Mitigation Plan and Borrow Pit Lake Investigation and Remediation Plan are discussed in Sections 2.0, 3.0 and 4.0 of this document, respectively.

2.0 Habitat Assessment

The Time-Critical Sediment Removal Action UAO did not specify the type or duration of baseline habitat assessment that needed to be performed. All that the Order required was that "Sixty days after the completion of the sediment and soils removal activities required by this Order, Respondents shall submit to EPA a Mitigation Plan which .... shall provide an accounting of all wetlands and habitat adversely affected by the project".

The Baseline Habitat Assessment, summarized in Section 2.1 and included in Appendix 1 of this Mitigation Plan, was performed to partially address this requirement of the UAO. To fully-address the requirement, a post-removal assessment needs to be performed. Performance of the Post-Removal Habitat Assessment is on hold pending USEPA review of the Dead Creek Final Remedy Engineering Evaluation/Cost Analysis submitted on June 21, 2002.

Placing the Baseline Habitat Assessment in a local and regional context and evaluating the overall habitat value of Dead Creek and the Borrow Pit Lake were not required by the UAO. However, this information was collected for performance of the Sauget Area 1 Ecological Risk Assessment and is incorporated into Section 2.2 of the Mitigation Plan.

2.1 Baseline Habitat Assessment

The Time Critical Sediment Removal Action UAO was issued by the Agency on May 31, 2000. Since this was a time-critical removal action, work was planned, approved and implemented in an expeditious manner that did not allow for assessment of baseline habitat conditions for a year period prior to implementation of the removal action. On June 30, 2000, the Draft Time Critical Removal Action Work Plan was submitted to the Agency. The Baseline Habitat Assessment was performed in October and November 2000, just before installation of the sediment dewatering system, which began in November 2000 and finished in February 2001. Containment cell construction started in April 2001, when the Work Plan was approved. Sediment removal was started in June 2001 and completed in February 2002.

To compensate for the lack of seasonal, site-specific observations of the extent of migratory bird use during spring and fall migrations, nesting use in summer months, herpetological use in the

spring and summer and plant community composition changes throughout the course of the growing season, literature sources were used to provide information on the plant and animal species that were or might be present in the Dead Creek corridor.

In November 2000, prior to the start of the Sediment Removal Action, Woodlot Alternatives, Inc. performed a baseline habitat assessment for Creek Segments B, C, D and E and Creek Segment F upstream of the Terminal Railroad Embankment. During this assessment, qualitative and quantitative information on plants, animals, vegetation alliances and hydrologic regimes was collected to identify organisms potentially at risk from the removal action and provide the information needed to develop habitat restoration plans.

Dead Creek and adjacent riparian communities form a narrow, linear wetland system that passes through Sauget and Cahokia, Illinois. Portions of Dead Creek are adjacent to residential and business lots that contain mowed lawns, buildings, driveways and roads. Land uses in the top of bank areas along Dead Creek are summarized below:

Summary of Land Use Adjacent to Dead Creek in Cahokia and Sauget, Illinois

Segment	East Bank			West Bank		
CS-B	Industrial	620 ft.	32.6 %	Undeveloped	1,140 ft.	62.6 %
	Agricultural	740 ft.	38.9 %	Agricultural	680 ft.	37.4 %
	Undeveloped	380 ft.	20.1 %	**Total**	1,820 ft.	100.0 %
	Residential	160 ft.	8.4 %			
	Total	1,900 ft.	100.0 %			
CS-C	Residential	360 ft	24.0 %	Recreational	300 ft.	19.4 %
	Undeveloped	600 ft.	40.0 %	Residential	740 ft.	48.1 %
	Residential	540 ft.	36.0 %	Recreational	360 ft.	23.4 %
	Total	1,500 ft.	100.0 %	Residential	140 ft.	9.1 %
				Total	1,540 ft.	100.0 %
CS-D	Residential	920 ft.	100.0 %	Residential	800 ft.	88.9 %
	Total	920 ft.	100.0 %	Commercial	100 ft.	11.1 %
				Total	900 ft.	100.0 %
CS-E	Residential	100 ft.	2.7%	Institutional	120 ft.	3.3 %
	Undeveloped	640 ft.	17.1 %	Residential	480 ft.	12.9 %
	Institutional	380 ft.	10.2 %	Undeveloped	600 ft.	16.1 %
	Residential	240 ft.	6.4 %	Residential	760 ft.	20.2 %
	Commercial	60 ft.	1.6 %	Undeveloped	420 ft.	11.3 %
	Residential	510 ft.	13.6 %	Institutional	900 ft.	23.9 %
	Commercial	70 ft.	1.9 %	Residential	480 ft.	12.3 %
	Agricultural	160 ft.	4.2 %	**Total**	3,760 ft.	100.0 %
	Institutional	1580 ft.	42.3 %			
	Total	3,740 ft.	100.0 %			

Creek Segment F, between Cargill Road and the Borrow Pit Lake is a 350 ft. wide undeveloped area bounded by agricultural areas on both sides of the channel. To a great extent, these areas

are so modified that only relict portions of natural vegetation alliances exist. Furthermore, many areas are also influenced by non-native plant species.

Habitats in the Dead Creek Baseline Habitat Assessment study area breakdown as follows:

• Forests	8.2 Acres	47.4 %
• Shrublands	0.1 Acres	0.6 %
• Herbaceous Alliances	2.2 Acres	12.7 %
• Wetlands	3.2 Acres	18.5%
• Open Water	3.6 Acres	20.8 %
Total	17.3 Acres	100.0 %

Sections of the creek are utilized by rare species indicating that Dead Creek does posses value for wildlife habitat and as a travel corridor. Two rare species, specifically the Brown Creeper (a bird) and Early Wild-rye (a grass), were observed in Dead Creek Segments B and C, respectively.

Brown Creeper (Serthia americana) singing was heard on November 8, 1999 in Creek Segment B. This area possessed a few, very large diameter, dead, standing trees which provide habitat for this bird. It is likely that Brown Creeper use of Dead Creek is minor due to limited intact forest and the young age of most trees.

Early Wild-rye (Elymus macregorii) appears to be rare in Illinois and information on its occurrence in Creek Segment C was included in the Baseline Habitat Assessment in the event it became a state-tracked species. The only occurrence of this grass in the study area was from a Fraxinus pennsylvanian-Ulmus americana Temporarily Flooded Forest in Creek Segment C. It was located on the east bank of Dead Creek, upstream of Cahokia Street within wetland characterization plot C-4. Plants were limited to a small area (7 sq. ft.) and were senescent with dispersing fruits at time of observation (November 1999).

Vegetation alliances were identified during field surveys performed on November 2, 8, 9, 10 and 11, 2000 and were mapped to determine the areal extent of each alliance. Quantitative and qualitative data regarding plant species abundance and distribution were collected for all dominant vegetation communities. Quantitative data on plant species composition and abundance were collected in 9m radius plots for trees, lianas, saplings, shrubs, seedlings and herbs. Qualitative data collected outside of the plots included photographs of each community,

a list of all plant species observed and general descriptions of the degree of anthropogenic disturbance and estimated age of forested communities.

Nine vegetation alliances were identified in Dead Creek:

- Fraxinus americana - Ulmus americana Temporarily Flooded Forest
- Populus deltoides Temporarily Flooded Forest
- Salix nigra Temporarily Flooded Forest
- Cephalanthus occidentalis Semi-Permanently Flooded Shrubland
- Persicaria - Mixed Forb Temporarily Flooded Herbaceous
- Typha Seasonally Flooded Herbaceous
- Potamogeton - Ceratophyllum - Elodea Permanently Flooded Herbaceous
- Temporarily Open Water
- Permanent Open Water

Dead Creek is occupied to a significant extent by non-native, invasive plant species. Though exotic herbaceous species are present, it is the introduced and escaped woody species found in the forested communities that are most prevalent. White mulberry, Siberian elm, paper mulberry and tree-of-heaven are frequent throughout the study area and, in some cases, locally dominant. Common, non-native lianas, including trumpet-creeper, Japanese honeysuckle and Chinese spindle-tree, were frequently seen growing as a dense mat over the ground or other woody species. Amur honeysuckle is the common, non-native shrub in the study area.

Qualitative information on animal use was collected through direct observation of species or their sign, by a review of previous site investigations and by comparing habitat available on site to habitat requirements of species known or suspected to occur in or near the project area. Information on aquatic invertebrates and fish was obtained from previous investigations and dip nets surveys performed during the Baseline Habitat Assessment. Amphibians, reptiles, birds and mammals seen on the site were recorded.

Animal use is generally limited to species that do not require large tracts of pristine land and can tolerate some level of habitat modification and disturbance. Several species of birds were observed including American robin, northern cardinal, blue jay, northern mockingbird, Carolina wren, sparrows, Eurasian tree sparrow, European starlings, waterfowl, wading birds and great horned owl. Mammals using Dead Creek include eastern chipmunks, gray squirrels, raccoons and white-tailed deer.

Rare species observed in the Dead Creek include one state threatened species of bird, Brown Creeper (Serthia americana), and one potentially rare grass, Early Wild-rye (Elymus macregorii).

A qualitative wetland function-value assessment was performed to document existing functions and values in Dead Creek. Results of surveys and community plot sampling along Dead Creek indicate that it is a highly modified wetland system that, for much of the season, appears to act more as a set of shallow ponds rather than a riverine system. Dead Creek Segments B, C, D, E and F and the Borrow Pit Lake typically fill with water during spring rains. Runoff from spring rains discharging into Dead Creek at road crossings or falling directly on the creek channel fills CS-B, C, D and E. Runoff from the floodplain in these creek segments does not readily reach Dead Creek because the floodplain is lower than the creek or there is little or no natural or engineered drainage to route runoff to the creek. Undersized culverts located above the channel bottom at Judith Lane, Edwards Street, Kinder Street, Jerome Lane, Edgar Street and the Parks College parking lot act as flow constrictions and detain storm water.

Flow is also restricted by the low gradient in Dead Creek. Channel bottom centerline elevation at the low point of Creek Segment B, after completion of sediment removal, was 396.06 while the low point elevation of the channel centerline at the Cottonwood Apartments at the downstream end of Creek Segment E was 395.53 ft. amsl. This is a drop of 0.53 ft. over a distance of approximately 8,000 ft., a gradient of 0.35 feet per mile or 0.007%. A one percent slope is typically the minimum design for channel flow.

Creek Segment F fills with flow from upstream creek segments; runoff from Route 157, Route 3 and Cargill Road; runoff from the Phillips Pipeline property and other areas adjacent to CS-F. When the rise in Mississippi River stage triggers closure of the flap valves discharging water from Dead Creek beneath the levee at Old Prairie du Pont Creek, storm water is detained and accumulates in Creek Segment F and the Borrow Pit Lake. Storm water is also detained in Creek Segment F because the channel bottom elevation at its confluence with the Borrow Pit Lake is four feet lower that the elevation of the bottom of the Borrow Pit Lake (392.08 ft amsl vs. 396.4 ft, respectively). With this elevation differential, the Borrow Pit Lake acts as a dam causing water to backup in the channel portion of CS-F upstream of its confluence with the BPL.

From late summer through winter, Dead Creek and the Borrow Pit Lake are typically drying up or dry, creating intermittent, isolated water bodies. When water levels in Creek Segments B, C, D and E fall below the culvert inverts at Judith Lane, Edwards St., Kinder St., Jerome Lane, Edgar Street and the Parks College parking lot during dry weather conditions, a series of stagnant, discontinuous pools with no flow are created upstream of each road crossing. Pools in Creek Segments B, C, D and E routinely dewater or dry up in warm weather and/or low rainfall periods. Creek Segment F north of the Terminal Railroad embankment dries up also in these weather conditions. CS-F south of the Terminal Railroad embankment dewaters but does not dry up, probably as a result of water flow from the Phillips Pipeline property.

As reported in the June 2001 Sauget Area 1 Ecological Risk Assessment, water levels were extremely low in Dead Creek and the Borrow Pit Lake during the Sauget Area 1 Support Sampling Plan ecological site reconnaissance and sampling in September, October and November 1999. Many areas of these water bodies were dry with exposed mud. Fish and other aquatic organisms (e.g. frogs) were concentrated in shallow puddles. The Borrow Pit Lake was in the last stages of drying up when the Support Sampling Plan fish tissue sampling was conducted in October and November1999. These low water levels were persistent region-wide.

Observations made in the field in 1999 indicate that the water level in the Borrow Pit Lake and Creek Segment F were low. This may be due to natural fluctuations in water level and may also be linked to the particularly dry growing season in 1999. Dead Creek was a series of small, shallow water bodies of standing water. Examination of the creek bed and riparian vegetation suggests that Dead Creek does not retain substantial amounts of standing water during the summer months and that water levels are dependent on relatively recent precipitation.

A memorandum authored by Bill McClain of the Illinois Department of Conservation (dated July 23, 1992 and received by Tom Crause at the Illinois Department of Natural Resources on July 29, 1992) contains observations of Creek Segments B through F indicating that a low water level is a normal condition in Dead Creek. Historical information from a 1984 survey of the American Bottoms conducted by IEPA and reported in 1989 indicated that 12 out of 14 streams were at low flow conditions in the summer. Historical discharge data for other creeks in St. Clair County, Illinois (Canteen Creek, Mud Creek and Richland Creek) indicates a high variability in

discharge over each year. However, for a large portion of each year, discharge is very low, often near zero. Both of these patterns occur each year, suggesting that low to zero flow conditions, as seen in Dead Creek in 1999, are common.

Annual dewatering/desiccation of Dead Creek and the Borrow Pit Lake creates an aquatic habitat that is not conducive to a sustainable fish population. Streams in the mid-American Bottoms basin, in which Dead Creek and the Borrow Pit Lake are located, are considered moderate to limited aquatic resources.

Riparian communities along Dead Creek portray classic symptoms of residential development, including narrow and fragmented forests, young canopy trees, limited vertical diversity in terrestrial habitats, bisection by numerous roads, disturbed drainage and a high incidence of non-native species. Dead Creek, nonetheless, plays an important role in the local storm water flow, is a wildlife travel corridor and is utilized by rare and uncommon plant and animal species.

Results of the baseline habitat assessment are presented in Appendix 1.

2.2 Local and Regional Habitat Value of Dead Creek

Information on the local and regional habitat value of Dead Creek was collected for performance of the Sauget Area 1 Ecological Risk Assessment. Menzie-Cura & Associates made observations of the site in 1966 and the site and reference areas in September, October and November 1999. Information presented here is also based on research on ecological receptors at the site.

2.2.1 Dead Creek Habitat

The Dead Creek channel and riparian communities form a narrow, linear wetland system that passes through suburban Cahokia. Portions of Dead Creek are adjacent to residential and business lots that contain mowed lawns, buildings, driveways and roads. To a great extent, these areas were modified so that only relict portions of natural vegetation alliances exist. Furthermore, many areas are also influenced by non-native plant species. Sections of the creek, however, are used by rare species monitored by the Illinois Endangered Species

Protection Board. This illustrates that Dead Creek does possess value for wildlife habitat and as a travel corridor.

Dead Creek's wetlands appeared healthy with no evidence of ecological stress (no chlorotic plants, no monospecific stands of vegetation, no areas of dying or dead vegetation, no observed surface water sheens or sediment staining) with the exception of extremely low water levels observed in Fall 1999, when portions of Dead Creek and the Borrow Pit Lake dried out completely. The wetlands appeared to support a diverse aquatic and terrestrial wildlife community, with abundant prey species (i.e. fish, frogs, turtles) and predatory species (i.e. wading birds, waterfowl, raccoons).

Animal use of Dead Creek is generally limited to species that do not require large tracts of pristine land and can tolerate some level of habitat modification and disturbance. These animals are mostly species that can use residential areas for foraging and/or shelter or are smaller vertebrates that have limited spatial requirements.

Birds - Several species of birds were observed using Dead Creek and the adjacent riparian corridor for foraging an roosting. Many of the birds seen were those that frequent residential areas (e.g. American robin, northern cardinal, blue jay, northern mockingbird) and could use the area of the Dead Creek floodplain for nesting. Carolina wrens, several species of sparrows and Eurasian tree swallows were noted using dense shrub and liana thickets. European starlings were seen roosting in large flocks in the larger tress along Dead Creek. Limited use of the open water sections by waterfowl and wading birds does occur. These open water areas are likely to be used during the breeding season for feeding by swallows, phoebes and flycatchers. On two occasions, a great horned owl was seen in or near the study area.

Two bald eagles, a federal-listed endangered species, were observed by USEPA and IEPA approximately one mile west of Dead Creek Segment B and 0.5 miles east of the Mississippi River in late 1999. A bald eagle was also observed in the same location in December 2000.

Small numbers (one to ten individuals) of state-listed endangered or threatened wading birds were found foraging along sections of Dead Creek. Observed state-listed endangered species included little blue heron (Egretta caerulea), snowy egret (Egretta thula) and black-crowned

night heron (Nycticorax ncyticorax). Great egret (Casmerodieu albus), an Illinois threatened species, was also observed.

Mammals - Mammals using Dead Creek habitats were primarily rodents, small omnivores and likely bats and insectivores (i.e. shrews). Eastern chipmunks and gray squirrels were seen frequently during the surveys. Raccoon tracks were found nearly everywhere the ground surface was conducive to track formation. The only large mammal documented in the study area was white-tailed deer. Numerous tracks were observed of this species. USFWS service lists the Indiana bat as a federal endangered species. The Indiana bat requires a habitat of small stream corridors with well-developed riparian woods and nearby upland forest. The wooded areas around Dead Creek and the Borrow Pit Lake are not well developed due to residential and agricultural uses and, therefore, do not provide good habitat for the Indiana bat.

Herptiles - Few amphibians and reptiles, collectively called herpetiles, were observed in the vicinity of Dead Creek. However, the stream channel and adjacent riparian forest provide habitat for a number of species that can occur in small, somewhat disturbed water bodies. Animals that are ubiquitous in many wetland types in the United States, such as bull frogs, northern cricket frogs, painted turtles, red-eared sliders and common garter snakes, are expected to use Dead Creek for feeding and shelter.

Fish - Though Illinois has a rich fish fauna, it was expected that few species would be found in Dead Creek. Due to blocked drainages and elevated culverts, much of the upper Dead Creek functions more as a series of linear, shallow ponds rather than a flowing stream course. Therefore, during much of the year, it would be difficult for fish to move through the watershed to escape declining water levels or other stressful conditions (e.g. high water temperature, low dissolved oxygen, avian predators). Furthermore, Dead Creek generally possessed turbid water and a soft bottom, eliminating species that require clear water and firm substrate. Fish were only observed in Creek Segments B and D during implementation of the Sauget Area 1 Support Sampling Plan. No fish were observed in Creek Segment F.

2.2.2 Borrow Pit Lake

Creek Segment F of Dead Creek flows through riparian woods and shrubs into the southern third of the Borrow Pit Lake, which is the largest non-flowing water body in the area. Its shore is surrounded with mature riparian trees. Based on observations made in September 1999, very little submerged or emergent vegetation appears to grow in the Borrow Pit Lake. In October 1999, water levels were extremely low and sediment was exposed in large portions of the Borrow Pit Lake. Ducks, herons and fish were observed in the lake. Observed fish species included: white crappie, largemouth bass, bluegill sunfish, brown bullhead, yellow bullhead, walleye, drum, silver carp and gar.

Extensive wetlands occur west of Route 3, particularly in the vicinity of the Borrow Pit Lake. These wetlands receive water from both Dead Creek and from drainage areas to the north.

2.2.3 Regional Habitat

Old Prairie du Pont Creek - During high water conditions, Dead Creek flows from the Borrow Pit Lake into the ditched section of Old Prairie du Pont Creek. At the confluence of Dead Creek and Old Prairie du Pont Creek and above it, the ditch shore is vegetated with grasses, herbs and small shrubs. This portion of Old Prairie du Pont Creek is maintained as a storm water drainage ditch routing runoff from this portion of the American Bottoms to the Mississippi River. During high river stage, Old Prairie du Pont Creek becomes a backwater area impounding water between the flood-control levees constructed on both banks.

Habitat in Old Prairie du Pont Creek at East Carondelet, Illinois, approximately 3 miles southwest of the Dead Creek watershed, was evaluated during implementation of the Sauget Area 1 Support Sampling Plan ecological sampling. Here, Old Prairie du Pont Creek is a broad, shallow water body with a mud substrate similar to the Borrow Pit Lake. It is also similar to the Borrow Pit Lake in that it is near agricultural land, it has a narrow riparian zone and it has little to no emergent or submerged vegetation. It supports an aquatic community similar to the Borrow Pit Lake with many of the same species present. Fish species present included brown bullhead, crappie, bluegill sunfish and largemouth bass. Clams and shrimp were the invertebrates present in this stretch of Old Prairie du Pont Creek. Great and snowy egret were observed in this area.

Cahokia Chute and Arsenal Island - Flow in the ditched section of Old Prairie du Pont Creek is northwest to Arsenal Island on the Mississippi River. Arsenal Island contains areas of mature riparian woods and agricultural fields. The shoreline of the lower end of the ditch, referred to as the Cahokia Chute, is lined with riparian woods, principally large cottonwoods and willow. Large catfish, wood ducks, wading birds and turtles were observed in the channel.

Cahokia Chute forms the eastern border of Arsenal Island. The waterway flows north to south, draining the region northeast of the island. During times when the Mississippi River is high, it appears that the river uses the chute channel to flow around Arsenal Island. Therefore, any water from the Dead Creek watershed only flows through the lower half of the Cahokia Chute between the confluence with the ditched Old Prairie du Pont Creek and the Mississippi River. The remains of a bald eagle nest and congregating wading birds were observed in 1996at the southern tip of Arsenal Island where the Chute flows into the Mississippi River.

In 1993, a pair of bald eagles (the only federal endangered or threatened species in the study area) unsuccessfully attempted to nest at the southern end of Arsenal Island where the ditched portion of Old Prairie du Pont Creek enters the Mississippi River. The pair was apparently scared off the site based on the unsuccessful nesting attempt. The next year the pair returned to the island, but no monitoring was conducted to determine if they successfully nested. The nest has since blown down and no other nests were constructed on the island.

Nc wading bird colonies are located within the study area. Small numbers (one to ten individuals) of state-listed endangered or threatened wading birds were found foraging along the ditched length of Old Prairie du Pont Creek, Cahokia Chute and the Mississippi River. Observed state-listed endangered species included little blue heron (Egretta caerulea), snowy egret (Egretta thula) and black-crowned night heron (Nycticorax ncyticorax). Great egret (Casmerodieu albus), an Illinois threatened species, was also observed. The largest concentration of foraging herons (approximately ten individuals at a location) was observed at the confluence of Dead Creek and the ditched Old Prairie du Pont Creek and where the ditched Old Prairie du Pont Creek flows into the Mississippi River. These areas likely support the best concentration fishing areas for wildlife along the waterways.

East St. Louis - Two 1,000 to 2,000 mixed-species wading bird colonies are located in the region. One of these colonies is located approximately one mile east of Sauget Area 1 near the Alton and Southern rail yards in Alorton. The second colony is located over two miles to the north of Sauget Area 1 at Audubon Avenue and 26th Street in East St. Louis, Illinois. These two colonies contain the only breeding little blue heron and snowy egret in Illinois. In addition, black-crowned night heron, great egret, cattle egret (Bubulcus ibis), great blue heron (Ardea herodias) and green-backed heron (Butorides virescens) nest in these colonies.

In 1988, USFWS collected black-crowned night heron and little blue heron eggs from the Alorton colony for contaminant analysis because the region was heavily industrialized with numerous Superfund sites. PCBS, DDE and metals were detected at varying levels in the wading bird eggs. The observed endangered and threatened wading birds foraged on a wide range of aquatic organisms, such as fish, frogs and crayfish, as well as some terrestrial species such as reptiles and insects. USFWS found that these wading birds foraged over a wide area around East St. Louis. Wetlands in Dead Creek and the Old Prairie du Pont Creek composed a relatively small percentage of the available wetland foraging area in the region.

American Bottoms - Long Slash Creek north of the culvert where Merrimac Road crosses the creek (Reference Area 2-1) is located approximately 20 miles south of the Dead Creek watershed. Habitat in this creek is similar to that in Dead Creek Segments B, C, D and E. It is shallow and muddy with a road crossing and agricultural fields down to the water's edge. There was evidence of beaver activity at the culvert under the road crossing. Biota present included creeping buttercup and snails.

A flooded borrow pit north of Fountain Creek was also evaluated as part of the Sauget Area 1 Support Sampling Plan (Reference Area 2-2). This water body, approximately 20 miles south of Dead Creek, had a muddy substrate and a fish and invertebrate community similar to the Borrow Pit Lake. Vegetation surrounding this flooded borrow pit consisted of a thin riparian zone

2.2.4 Habitat Observations

- Dead Creek and adjacent riparian communities form a narrow, linear wetland system with value for wildlife habitat and as a travel corridor. Examination of creek bed and riparian

vegetation suggests that Dead Creek does not retain substantial amounts of standing water during the summer months and that water levels are dependent on relatively recent precipitation. Streams in the middle portion of the Americans Bottom Basin, in which the Dead Creek watershed is located, are considered moderate to limited aquatic resources. 12 out of 14 streams in the American Bottoms area surveyed by IEPA in 1984 were in low flow conditions during the summer with low to extremely low dissolved oxygen concentrations. Stream flow records for Canteen Creek, Mud Creek and Richland Creek, all of which are located in St. Clair County, Illinois, indicate that discharge is low, often near zero, for a large portion of each year.

- Much of Dead Creek (Creek Segments B, C, D and E and the upstream portion of Creek Segment F) flows through suburban Cahokia, Illinois adjacent to residential and business lots that contain mowed lawns, buildings, driveways and roads. Relict portions of natural vegetation alliances occur in the developed stretch of Dead Creek (Creek Segments B, C, D and E and the upstream portion of Creek Segment F). However, there is sufficient natural riparian vegetation to support local aquatic and terrestrial communities

- The Dead Creek watershed supports a diverse plant community although many areas are influenced by non-native plant species. Forest, shrubland and open water in Dead Creek watershed provide some landscape diversity, however, the early age of most of the communities (due to disturbance) provides limited structural diversity.

- The Dead Creek watershed supports a diverse animal community although animal use is generally limited to species that do not require large tracts of pristine land and can tolerate some level of habitat modification and disturbance.

- Birds and wildlife species are abundant in the Dead Creek watershed and making use of the habitat, which is also used by rare (brown creeper), threatened (great egret) and endangered (little blue herons, black-crowned night herons and snowy egrets) species. Use of Dead Creek by rare bird species is minor due to limited intact forest and the young age of most trees. Endangered bird species forage over a wide area with the Dead Creek watershed forming only a small part of their availability feeding territory.

- Few fish species were found in Dead Creek Segments B, C, D, E and the channel portion of Creek Segment F because blocked drainages and elevated culverts create a series of linear, disconnected, shallow ponds that make it difficult for fish to move through the watershed to escape declining water levels, high water temperature, low dissolved oxygen, avian predators or other stressful conditions.

- A variety of fish species were present in the Borrow Pit Lake, which is the largest non-flowing water body in the area. Fish probably enter the Borrow Pit Lake in the spring during high water stage in the Mississippi River before the river stage is high enough to close the flap valves on the pipes beneath the levee at Old Prairie du Pont Creek. During dry weather conditions, water levels in the Borrow Pit Lake are low with large areas of exposed sediment.

- Ecological stresses observed in the Dead Creek watershed, namely lack of submerged or emergent vegetation and impaired benthic community, are due to poor habitat conditions

including low water levels, silty substrate and low dissolved oxygen concentrations. No other evidence of ecological stress was evident in the Dead Creek watershed.

- Moderate to limited aquatic resources, similar to the stream portion of Dead Creek, occur regionally in the American Bottoms, e.g. Old Prairie du Pont Creek, Long Slash Creek and Fountain Creek. Habitats similar to the Borrow Pit Lake also occur regionally in the American Bottoms, e.g. the Fountain Creek borrow-pit lake. Better habitats than Dead Creek and the Borrow Pit Lake are also present regionally, e.g. Cahokia Chute and Arsenal Island and the wading-bird rookeries in Alorton and East St. Louis.

3.0 Creek Channel Mitigation Plan

A baseline habitat assessment performed by Woodlot Alternatives, Inc. demonstrated: 1) that a variety of alliances or communities were present on site prior to the sediment removal action, 2) they were limited in habitat quality by size and 3) significant non-native species occurred in the project area (Appendix 1). The goal of this revegetation plan is to restore the creek to a more natural, native landscape that can become an effective greenway/wildlife corridor through the middle of this urbanized area. Dead Creek connects with other quality natural areas near the Mississippi River at its downstream end. Therefore, by re-establishing native vegetation and connecting it with other natural areas, Dead Creek has the potential of becoming an effective and beautiful greenway corridor through the local community.

Specifically, the Creek Channel Mitigation Plan is focused on:

- Re-establishing Dead Creek as an amenity to the local community;
- Creating a quality, natural landscape with native, locally appropriate plant species;
- Achieving success by using readily available plant species; and
- Using methods and equipment associated with habitat restoration contractors.

These goals will be achieved by incorporating a variety of native seeds in the upland and channel sections of Dead Creek. Mulch will be installed for erosion control during the establishment period. Incorporated seeds will not include any woody or non-seed species because significant evidence suggests that prior to settlement, many areas in St. Louis, including some streams, were prairie or savanna in community. Additionally, in order to provide the best stabilization of the creek banks, grasses and grass-like plants, as well as a diversity of forbs, are required. Finally, unless maintained in a prairie or savanna like community, it is likely that a variety of tree species may, over time, begin to dominate the project area without being installed with this project. Therefore, the revegetation plan for Dead Creek is focused on utilizing locally appropriate native seeds.

One of the two remedial alternatives considered in the June 21, 2002 Dead Creek Final Remedy Engineering Evaluation/Cost Analysis, was containment of creek bottom soils with constituent concentrations above site-specific, risk-based levels by armored impermeable liners.

Such liners would be utilized to remediate creek bottom soil in all of Creek Segment B (1,800 linear feet), as required by the Sediment Removal Action UAO, and Creek Segment F from the Terminal Railroad Embankment to a point 800 ft. south of the embankment.

Construction of the armoring system should not require grubbing to remove trees, shrubs, roots and debris from the creek channel, as sediment excavation was recently completed (February 2002). Contouring and/or filling may be conducted in and adjacent to the channel to achieve channel sections and top of bank topography that will facilitate the installation of the armored liner, and that will allow for installation of a stable finished cap. Armored liners will consist of four components listed below from bottom to the top of the liner system:

- Base Geotextile;
- 40-mil HDPE Liner;
- Covering Geotextile; and
- Riprap

Installation of soil in the interstices of the riprap and revegetation is not part of this design but could be included given the low gradient/low energy environment found in Dead Creek. If this were done, root penetration of the HDPE liner is highly unlikely unless the membrane is damaged during or after installation. Installation of a base geotextile below the HDPE liner and a covering geotextile on top of the HDPE lining, and placement of riprap in such a manner as to not damage the membrane, will prevent liner damage and eliminate the potential for root penetration.

As an alternative to riprap, 3 ft. of well-graded crushed rock ("dense grade") could be placed on top of the cover geotextile, a geotextile could be placed on top of the dense grade to act as a marker layer for the membrane liner and a vegetative growth layer could be placed on top of the geotextile. Channel bottom and side slopes could then be seeded with the seed mix proposed in the revised Mitigation Plan.

3.1 Creek Segments B, C, D and E Revegetation Plan

A number of measures to avoid and/or minimize adverse impacts to wetlands and habitat during implementation of the removal action were included in the June 30, 2001 Time Critical Sediment Removal Action Work Plan. A summary of these actions is given below

Creek Segment B - "Trees growing within the creek channel and branches hanging over the channel that might interfere with equipment operation will be chipped and incorporated in the impacted sediment. Most the CS-B channel is clear of trees except for the north end immediately south of Queeny Avenue. These trees will need to be removed in order to conduct the sediment removal action. The east bank of CS-B is lined with trees from Queeny Avenue south to the north side of Site M. These trees will not be removed as part of the sediment removal action. Only branches hanging over the creek will be cut and chipped if they can interfere with the safe and efficient implementation of the sediment removal action."

Creek Segment C - "While trees line a good portion of the creek banks of CS-C, the creek channel is clear of trees. Consequently, tree removal will not be necessary except where branches overhanging the channel might interfere with equipment operation. Such branches will be removed, chipped and incorporated in the impacted sediment."

Creek Segment D - "While trees line a good portion of the creek banks of CS-D, the creek channel is clear of trees. Consequently, tree removal will not be necessary except where branches overhanging the channel might interfere with equipment operation. Such branches will be removed, chipped and incorporated in the impacted sediment."

Creek Segment E - "While trees line most of the east creek banks [of CS-E between Jerome Lane and Edgar Street], the creek channel is clear of trees. Consequently, tree removal will not be necessary except where branches overhanging the channel might interfere with equipment operation. Such branches will be removed, chipped and incorporated in the impacted sediment. ... Trees line both banks of the creek [in the stretch of Creek Segment E between Edgar Street and the second of the three streets in the Quail Run trailer park], however, the channel is clear of trees. Consequently, tree removal will not be necessary except where branches overhanging the channel might interfere with equipment operation. Such branches will be removed, chipped and incorporated in the impacted sediment. ... In the stretch of Dead Creek between the second street in the Quail Run trailer park and the north end of the Parks College parking lot, one to six-inch diameter trees are growing in the channel bottom and line both banks of the channel. These trees will need to be removed in order to excavate impacted sediments. Care will be taken to remove no more trees than necessary to excavate sediments in a safe and responsible manner. ... Small diameter trees are also growing in the CS-E channel from the south end of the Parks College parking lot to Route 157. These trees will be chipped and incorporated in the impacted sediment. Care will be taken to remove no more trees than necessary to excavate sediments in a safe and responsible manner. Large trees are growing on the banks in this stretch of the creek. Branches overhanging the channel that might interfere with equipment operation will be chipped and incorporated in the impacted sediment."

With two exceptions, the sediment removal action was performed as described above to minimize impact on habitat adjacent to the creek. One exception to the plan was removal of the trees along the east bank of Creek Segment B in order to provide access to implement the removal action. The other exception was using chipped trees as mulch in the areas adjacent to the creek rather than incorporating them into the impacted sediments. This increased the

volume available for impacted sediments in the containment cell and improved the moisture-holding capacity of the soils adjacent to the creek.

After completion of sediment removal, grasses were proposed for revegetation of the channel and top of bank area in Creek Segments B, C, D and D, instead of trees, shrubs and forbs, for the following reasons:

- Grasses were the original plant species prevalent in this area and local experts prefer to use them rather than trees, shrubs and forbs for restoration projects;
- Grasses are less likely to be perceived as weeds than forbs in developed and agricultural areas or undeveloped areas near residential/commercial areas and, therefore, are less likely to be cut back or eradicated by property owners and/or municipalities. Creek Segments B, C, D and E are bordered by developed or agricultural land or undeveloped land which is mowed to control weeds (as required by local ordinance); and
- Sediment removal in CS-B, C, D and E was performed within the creek channel with minimal disturbance to top of bank areas. Planting trees and shrubs in the channel is not considered appropriate for the reasons discussed below.

Equipment used to perform the sediment removal action in CS-B, C, D and E was confined to the creek channel except for six entry/exit points. Trackhoes, used to remove impacted sediment and load it into articulated haul trucks, worked within the channel. Haul trucks drove on plank roads within the channel until they reached an entry/exit point where they traversed the top of bank area to reach a paved road.

It is inappropriate to plant trees or shrubs in the channel of Dead Creek since they will reduce the channel section, impede downstream flow and increase the potential for flooding in residential and commercial areas. Re-establishment of tress and shrubs in the channel is also contrary to the objective of the Dead Creek Culvert Replacement Removal Action. Culverts at Cargill Road and the Terminal Railroad Embankment were replaced, under a UAO, to move water downstream from residential and commercial areas and reduce the threat of flooding. Trees and shrubs in the channel of Creek Segments B, C, D or E will reduce the flow improvements that resulted from the Culvert Replacement Removal Action.

Entry/exit points in Creek Segments B, C, D and E were located strategically along the channel at road crossings or areas where top of bank disturbance could be minimized. Each entry/exit point is listed below along with the type of land use found in the associated top of bank area:

- Creek Segment B - West Bank 300 ft. North of Judith Land (Grassy Field)
- Creek Segment C - West Bank at Judith Lane (Grassy Area Adjacent to Golf Driving Range)
- Creek Segment D - Kinder Street (Developed Area - Single Family Housing)
- Creek Segment E - East Bank at Edgar Street (Gravel Parking Lot)
  West Bank 100 ft. South of Trailer Park (Agricultural Land)
  East Bank Opposite Apartment Buildings (Grassy Area)

Due to the presence of developed and agricultural land or mowed undeveloped land at each of these entry/exit points, restoration of top of bank areas with trees, shrubs or forbs is not considered appropriate. That said, IDOT Class 5 and 5A forb seed mixes, as modified by USFWS, will be added to the IDOT 4A (Low Profile Native Grass) channel side-slope seed mix proposed in the Mitigation Plan as directed by USACE and USFWS. Revegetation plans also need to take into consideration that vegetation was re-established naturally this spring along most, if not all, of the Dead Creek channel.

Seed mixtures selected for this project represent a mix of plant species that are appropriate for native, naturalized areas, and are hardy, yet are not routinely invasive. In addition, they are taken from Illinois Department of Transportation native seed mixes and therefore have been proven and accepted by numerous Illinois agencies. Local contractors and seed suppliers are familiar with these products.

Two seed mixtures will be used in this section of Dead Creek: 1) IDOT Class 4A - Low Profile Native Grass and 2) IDOT Class 4B - Wetland Grass and Sedge Mixture. The Low Profile Native Grass Seed mix will include Little Blue Stem, Side-Oats Grama, Wild Rye, Prairie Drop Seed, Annual Ryegrass, Spring Oats and Perennial Ryegrass. The Wetland Grass and Sedge Mixture will include Annual Ryegrass, Spring Oats, Blue Joint Grass, Lake-Bank Sedge, Awl-Fruited Sedge, Tussock Sedge, Fox Sedge, Needle Spike Rush, Blunt Spike Rush, Fowl Manna Grass, Common Rush, Slender Rush, Torrey's Rush, Rice Cut Grass, Hard-Stemmed Bullrush, Dark Green Bullrush, River Bullrush, Softstem Bullrush and Prairie Cord Grass. IDOT Class 4A seed mixes will be planted on the channel side slopes and Class 4B mixes will be planted on the channel bottom.

As directed by USACE and USFWS, IDOT Class 5 and 5A forb seed mixes, as modified by USFWS, will be added to the IDOT 4A (Low Profile Native Grass) channel side-slope seed mix

proposed in the Mitigation Plan as directed by USACE and USFWS. These seed mixes will be modified as follows:

Remove: Shasta Daisy (Chrysanthemum maxim)
Blanket Flower (Gaillardia pulchallae)
Long-Headed Coneflower (Ratilba columnitera)

Reduce: Downy Sunflower (Helianthus mollis) in Class 5A seed mix to 3 to 5% by weight

Figures 3 - 1 through 3 - 13 show the planned planting locations of the seed mixes.

3.2 Creek Segment F Revegetation Plan

Rather than working in the channel, as was done in CS-B, C, D and E, sediment removal was performed from the bank in four distinct areas of CS-F:

- Route 157 to Route 3 — West Bank Opposite Cahokia Sign - Grassy Field
- Route 3 to Cargill Road — West Bank at Abundant Love Church - Parking Lot
- Cargill Road to the Terminal Railroad — West Bank - Grassy Field
- Terminal Railroad to Borrow Pit Lake — East Bank - Undeveloped Wooded Area

Planting trees, shrubs and forbs in the top of bank areas between Route 157 and the Terminal Railroad Embankment is not appropriate because such plantings would conflict with current land use.

Approximately 12 to 15 entry/exit points were necessary to perform the Sediment Removal Action in Creek Segment F downstream of the Terminal Railroad Embankment because of the length of this creek segment (approximately 4500 ft.). Entry/exit points to the creek channel, constructed every 100 to 150 ft., were made without cutting trees. However, 20 to 25 ft. of underbrush was removed at each entry/exit point in order to gain access to the channel. Dead trees in the channel were removed and used to create brush pile habitats along the border between the wooded area along Creek Segment F and the adjacent farm fields.

Given the undeveloped, wooded nature of the top of bank area along Creek Segment F from the Terminal Railroad Embankment to the Borrow Pit Lake and the brush that was removed to gain

access for the Sediment Removal Action, it is appropriate to plant shrubs (e.g. Winterberry, Silky Dogwood and Buttonbush) in the disturbed upland areas of this portion of the creek segment.

Planting forbs in the channel bottom and sides slopes in the undeveloped, wooded portions of Creek Segment F downstream of the Terminal Railroad Embankment is contrary to the concept of restoring the creek channel to its likely original habitat - prairie and savannah. Since this undeveloped area is currently wooded, it is appropriate to add IDOT Class 5 and 5A forb seed mixes, as modified by USFWS, to the IDOT 4A (Low Profile Native Grass) channel side-slope seed mix proposed in the Mitigation Plan.

Two seed mixtures will be used in this section of Dead Creek: 1) IDOT Class 4A - Low Profile Native Grass and 2) IDOT Class 4B - Wetland Grass and Sedge Mixture. The Low Profile Native Grass Seed mix will include Little Blue Stem, Side-Oats Grama, Wild Rye, Prairie Drop Seed, Annual Ryegrass, Spring Oats and Perennial Ryegrass. The Wetland Grass and Sedge Mixture will include Annual Ryegrass, Spring Oats, Blue Joint Grass, Lake-Bank Sedge, Awl-Fruited Sedge, Tussock Sedge, Fox Sedge, Needle Spike Rush, Blunt Spike Rush, Fowl Manna Grass, Common Rush, Slender Rush, Torrey's Rush, Rice Cut Grass, Hard-Stemmed Bullrush, Dark Green Bullrush, River Bullrush, Softstem Bullrush and Prairie Cord Grass. IDOT Class 4A seed mixes will be planted on the channel side slopes and Class 4B mixes will be planted on the channel bottom.

As directed by USACE and USFWS, IDOT Class 5 and 5A forb seed mixes, as modified by USFWS, will be added to the IDOT 4A (Low Profile Native Grass) channel side-slope seed mix proposed in the Mitigation Plan as directed by USACE and USFWS. These seed mixes will be modified as follows:

Remove: Shasta Daisy (Chrysanthemum maxim)
Blanket Flower (Gaillardia pulchallae)
Long-Headed Coneflower (Ratilba columnitera)

Reduce: Downy Sunflower (Helianthus mollis) in Class 5A seed mix to 3 to 5% by weight

Figures 3 - 1 through 3 - 13 show the planned planting locations of the seed mixes.

3.3 Specifications

Specifications for seeding and mulching are included in Appendix 2 and 3, respectively. These specifications will require any potential contractor to perform the work in a manner consistent with native vegetation restoration but also provide that contractor some latitude in how they accomplish this work. Therefore, a number of methods and techniques were identified that should provide the best establishment success.

Additionally, while the seed is germinating and beginning root and stem growth during the establishment period, mulch will maintain the seed in place and minimize erosion to the site. The mulching specifications were not "engineered" per se, but do set out requirements for meeting specific environmental conditions. The specifications note that manufacturer recommendations should be met and the local mulching materials supplier may become actively involved in the project as a result.

4.0 Borrow Pit Lake Investigation and Mitigation Plan

4.1 Site Description and Background

4.1.1 1997 Ecology & Environment Creek Segment F Preliminary Risk Assessment

Ecology and Environment performed a "Preliminary Ecological Risk Assessment for Sauget Area 1, Creek Segment F, Sauget, St. Clair County, Illinois (TDD: S05-9703-012, PAN: 7M1201SI)" for USEPA on August 31, 1997. The objective of the report was "to determine whether the site poses no immediate or long-term ecological risk or if a potential ecological risk exists and further evaluation is necessary". On April 18, 1997, E&E (D. Sinars and D. Robin) conducted a site investigation with USEPA (S. Bories, L. Evison and J. Chapman) and IEPA (P. Takacs).

As described in this report, Dead Creek Segment F is a wooded corridor ranging in width from approximately 20 to 100 feet with a predominantly cottonwood overstory. Trees form a mostly closed canopy over the upstream portion but Dead Creek broadened downstream so that the canopy covered only the bank. Vegetation was of low floristic quality, consisting primarily of invasive and pioneer plants, consistent with drainage of wetlands and clearing of woods in the 1930s and the highly disturbed surrounding agricultural and industrial land. However, the creek did provide good quality wildlife habitat as evidenced by the presence of the Black-Crowned Night Heron, a state-listed endangered species. Plentiful detrital inputs (twigs, bark and leaf litter) to the creek provided substantial food base to benthic invertebrates. Lack of riffle areas and, therefore, a potential for periods of low dissolved oxygen levels was noted as one limitation on benthic invertebrate populations.

During this one-day investigation, eight sediment samples were collected at the following locations:

Summary of 1997 E&E Preliminary Ecological Risk Assessment Sediment Sampling Locations

Upstream Sediment Samples

- F107 Borrow Pit Lake Backwater, Upstream of Confluence with Dead Creek
- F106 Ponded Area Downstream of Cargill Road and Phillips Pipeline Company

CS-F Channel Sediment Samples (Cargill Road to Borrow Pit Lake)

- F105 Dead Creek Channel Immediately Downstream of Terminal Railroad Embankment
- F101 Dead Creek Channel South of "Dog Leg" Turn
- F102 Dead Creek Channel Halfway to Confluence with Borrow Pit Lake
- F103 Dead Creek Channel Upstream of Confluence with Borrow Pit Lake
- F104 Dead Creek Channel at Confluence with Borrow Pit Lake

Downstream Sediment Samples

- F108/109 Borrow Pit Lake Downstream of Confluence with Dead Creek

Note: Sample F109 was a duplicate of Sample F108

Since the sample location map included in the E&E report was not drawn to scale, these sample locations are approximate.

Sediment samples consisted of two or three composites at each sampling location. The first aliquot of each composite was collected in the deepest portion of the channel. One or two additional aliquots were collected in suspected depositional areas in other portions of the channel at that sampling location. Samples were analyzed for Metals, PCBs, PAHs, Pesticides, TOC and Dioxin. Due to resource limitations, not every parameter was analyzed for every sample.

E&E performed the screening-level ecological impact assessment "with the following conservative assumptions:

1) The Area Use Factor is 100%: the organism spends all of its time in the contaminated area, so is constantly exposed;
2) Bioavailability is 100%: Conditions do not limit the uptake or adsorption of the contaminant;
3) The most sensitive life stage is present (e.g. early stage); and
4) Species feed entirely on the most contaminated dietary option.

Because this is a screening-level ecological risk assessment, uncertainty is intentionally assumed to be the worst-case scenario in order not to miss contamination that might be present."

Since the primary goal of the investigation was to screen for human health and ecological risk, maximum detected concentrations were used in the assessments. Results indicated that "maximum detections for all of the contaminants are below the human-health based risk values" and that "human health is not severely at risk".

When compared to ecological screening criteria, E&E reported that the data suggested "contamination is a problem". Specifically,

"The metals data indicate that severe contamination exists from arsenic and cadmium (SEL HQs greater than 1) and minor pollution from chromium, lead and mercury. All nine samples exceeded the SEL for arsenic (144 to 276 parts per million [ppm]), including the background, which had the lowest level (144 ppm). Three samples exceeded the LEL for cadmium, one of which exceeded the SEL. The other samples, including the background, were "non detect" for cadmium.

Three samples contained PCB Aroclor-1254, all of which were between the LEL and SEL. Only one sample (F105) contained PAHs. The four PAHs detected were similar to the LEL, but far below the SEL. The maximum concentration of dioxin detected exceeded the high risk concentration for both birds and mammals. In addition, pesticides were not detected above background in any sample.

Sample F104 contained the highest metal concentrations; sample F102 contained the highest PCB and dioxin concentration; and sample F105 was the only sample to contain PAHs. The background sample (F107) contained the lowest concentration of each contaminant, except barium. The duplicate samples, F108 and F109, showed very similar results."

The 1997 E&E Preliminary Ecological Risk Assessment did not discuss the areal distribution of analytical data. Five of the eight samples were collected in the channel of Dead Creek upstream of the Borrow Pit Lake. One of the eight samples was collected in a pond south of Cargill Road that discharges into the channel of Dead Creek. Two of the eight samples were collected in the Borrow Pit Lake (F107 and F108/109). One of the Borrow Pit Lake samples was collected upstream of the confluence with Dead Creek and the other sample was collected downstream of the confluence.

An examination of the analytical data, presented below, indicates that impacted sediments were confined to the channel portion of Creek Segment F, which was remediated as part of the Dead Creek Time Critical Sediment Removal Action.

Summary of 1997 E&E Preliminary Ecological Risk Assessment Sediment Analyses

	Upstream of Dead Creek		Dead Creek Channel Upstream of Borrow Pit Lake					Borrow Pit Lake Downstream of Dead Creek
	(BPL)	(CS-F)						
Constituent, mg/kg	F107	F106	F105	F101	F102	F103	F104	F108/9
Arsenic (6.0)	**144**	**160**	**166**	**232**	**187**	**213**	**276**	**199**
Barium (NA)	137	133	116	145	162	179	228	163
Cadmium (0.6)	ND	ND	ND	ND	**4.56**	**8.89**	**16.3**	ND
Chromium (26.1)	10.4	12.1	12.6	**44.2**	**29.0**	**43.8**	**27.2**	14.9
Lead (31.0)	28.2	28.3	**56.2**	**41.2**	**199**	**111**	**124**	**50.2**
Mercury (0.2)	ND	ND	ND	ND	**0.24**	**0.30**	**0.55**	0.12
Aroclor 1254 (0.06)	ND	ND	ND	ND	**2.1**	**0.50**	**0.52**	ND

Benzo(b)fluoranthene (NA)	NS	0.63	NS	NS	NS	NS	NS	NS
Benzo(g,h,I)perylene (0.17)	NS	**0.52**	NS	NS	NS	NS	NS	NS
Fluoranthene (0.75)	NS	0.62	NS	NS	NS	NS	NS	NS
Indeno(1,2,3-c,d)pyrene (0.2)	NS	**0.50**	NS	NS	NS	NS	NS	NS
Dioxin TEQ, ppt (21)	2.29	NS	**53.4**	**211**	11.5	NS	NS	NS

Notes: 1) Sediment LEL concentrations included in the E&E report are included in parentheses adjacent to each constituent and those constituents with concentrations greater than the LEL are high-lighted in bold.
2) LELs are based on concentrations where ecotoxic effects become apparent but the majority of sediment-dwelling organisms are not affected.

Constituent concentrations in the Dead Creek channel between the Terminal Railroad Embankment and the Borrow Pit Lake clearly show a potential for impact across several parameter groups (metals, PCBs and Dioxin TEQs). Data collected during implementation of the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan also indicated that sediments in this stretch of Dead Creek were adversely impacted. All sediments were removed from this portion of Dead Creek, as well as from the channel between Route 3 and the Terminal Railroad Embankment during the Time Critical Sediment Removal Action. Impacted sediments were also removed from Creek Segments B, C, D and E as part of this removal action.

Sediments in the ponded area immediately south of Cargill Road, and the Phillips Pipeline Company facility which discharges surface water into it, exceeded screening levels for Benzo(g,h,i)perylene and Indeno(1,2,3-c,d)pyrene by a factor of 3. This was the only sample analyzed for PAHs. PAH detections in this ponded area are to be expected given its location downstream of a paved, asphalt road with heavy truck traffic to the Cargill bulk grain terminal; Phillips Pipeline Company, a large, bulk petroleum storage and distribution facility built in the 1930s and still active today; and Rogers Cartage, a truck washing facility that operated upstream of Phillips until sometime in the 1970s.

None of the constituents detected in the sediment sample collected in the Borrow Pit Lake backwater upstream of the confluence with Dead Creek exceeded their respective LELs except for Arsenic, which seems uniformly distributed across all of the E&E sampling locations at concentrations higher than its LEL. Lead in the Borrow Pit Lake sediment sample collected downstream of the confluence with Dead Creek exceeded the sediment LEL by a factor of 2 with a detected concentration level of 50.2 mg/kg and an LEL of 31.0 mg/kg.

4.1.2 2002 Menzie-Cura Sauget Area 1 Ecological Risk Assessment

USEPA approved the Sauget Area 1 Support Sampling Plan, Human Health Risk Assessment Work, Ecological Risk Assessment Work Plan and RI/FS Work Plan on September 9, 1999. Ecological data collected as part of the Support Sampling Plan included the following samples:

Summary of Sauget Area 1 Support Sampling Plan Ecological Samples

	Sediment Samples		Sediment	Composite Tissue Samples		
	Industry-Specific	Broad-Scan	Bioassays	Fish	Prey	Plants
CS-B	10	3	3	1	1	3
CS-C	12	3	3	NS	1	3
CS-D	9	3	3	1	1	3
CS-E	26	3	3	NS	NS	2
CS-F	40	3	4	NS	NS	2
BPL	8	3	3	12	4	NS
OPDC	1	2	2	NS	NS	1
Reference Areas	0	4	2	11	7	1

Notes: **1) Industry-specific samples were analyzed for PCBs, Total Petroleum Hydrocarbons, Copper and Zinc.**
2) Broad-scan samples, which included sediment and tissue samples, were analyzed for VOCs, SVOCs, Pesticides, Herbicides, PCBs, Dioxin, Metals, Mercury and Cyanide.
3) Sediment bioassays consisted of acute and chronic exposure of Hyallela azteca and Chironomous tentans
4) NS indicates that insufficient tissue was available to allow sample collection and analysis.

These data were considered to have sufficient power to assess the risks associated with site-related constituents in Dead Creek and the Borrow Pit Lake and to confirm or refute the 1997 Ecology & Environment Preliminary Ecological Risk Assessment, which was a screening-level evaluation based on a eight sediment samples (6 samples from the channel of Creek Segment F and two samples from the Borrow Pit Lake) collected in one day.

Data collected as part of the Sauget Area 1 Support Sampling Plan, and evaluated in the Sauget Area 1 Ecological Risk Assessment, support the findings of the E&E Preliminary Risk Assessment. Specifically,

- Sediments in the channel of Dead Creek in Creek Segment F have an adverse ecological impact. These sediments were removed during implementation of the Sauget Area 1 Time Critical Sediment Removal Action to eliminate this impact; and
- Sediments in the Borrow Pit Lake may have an adverse impact due to the presence of a metal (mercury). These sediments need further characterization and assessment to determine actual or potential risks.

The primary difference between the Ecology & Environment Preliminary Risk Assessment and the Menzie-Cura Sauget Area 1 Ecological Risk Assessment, both of which evaluated the same areas (Creek Segment F and the Borrow Pit Lake), is that E&E identified Lead as a Constituent of Potential Concern (COPC) based on exceedance of a screening-level sediment criteria while Menzie-Cura identified Mercury as a Constituent of Concern (COC) based on the results of a site-specific ecological risk assessment. For this reason, it is considered appropriate to focus on Mercury rather than Lead during the further investigation of Borrow Pit Lake sediments required by the Sediment Removal Action UAO.

Aquatic impacts due mercury, such as toxicity and/or bioaccumulation, will depend upon the species of mercury present in the ecosystem. If mercury is in the form of Inorganic Mercury, it will not be readily available in the aquatic ecosystem. If it is in the form of Methyl Mercury, it will be readily available. Sediment and biota samples collected during implementation of the Sauget Area 1 Support Sampling Plan were analyzed for Total Mercury, not mercury species. However, comparing Total Mercury concentrations in sediment and biota samples collected during implementation of the Sauget Area 1 Support Sampling Plan allows a preliminary assessment of the bioavailability of mercury in sediments. This assessment is an important component of designing the Borrow Pit Lake Investigation Plan.

Total Mercury concentrations in Sauget Area 1 sediments are summarized below. Data for Creek Segments B, C, D E and F, which represent concentrations in sediments that were removed and transferred to the on-site containment cell during the Time-Critical Sediment Removal Action, are presented in order from upstream (Sample 1) to downstream (Sample 3) as are the Borrow Pit Lake sediment samples:

Summary of Total Mercury Concentrations in Dead Creek, Borrow Pit Lake and Reference Area Sediments

	Sample 1	Sample 2	Sample 3
Creek Segment B	0.96	1.5	1.4
Creek Segment C	0.66	0.64	0.58
Creek Segment D	0.5	0.42	0.35
Creek Segment E	0.51	0.3	0.3
Creek Segment F	0.3	1.1	0.45
Borrow Pit Lake	0.091	0.16	0.11
Reference Area 1	0.042	0.063	NS

Reference Area 2	0.048	0.04	NS

Note: 1) Concentrations in mg/kg

Total Mercury data are also available for creek bottom soil samples collected and analyzed after completion of sediment removal. These data are summarized below with data from Creek Segments B, C, D, E and F listed from upstream to downstream:

Summary of Maximum Total Mercury Concentrations in Dead Creek and Site M Bottom Soils

Transect/ Sample	CS-B	Site M	CS-C	CS-D	CS-E	CS-F
0	0.82	NS	NS	NS	NS	NS
1	0.23	NS	0.046	0.14	0.11	0.12
2	0.24	0.026	0.06	0.11	0.25	0.074
3	0.27	0.061	0.046	0.07	0.11	0.63
4	0.099	0.22	0.13	0.71	0.083	0.038
5	0.054	0.062	0.074	0.065	0.094	0.82
6	0.21	0.05	0.31	0.33	0.25	0.14
7	0.12	0.33	NS	NS	0.12	0.086
8	0.15	0.092	NS	NS	0.34	0.09
9	0.29	0.031	NS	NS	0.6	0.32
10	0.16	0.3	NS	NS	0.6	0.11
11	0.8	NS	NS	NS	0.46	0.093
12	0.84	NS	NS	NS	0.69	0.031
13	0.096	NS	NS	NS	0.84	0.018
14	0.032	NS	NS	NS	0.28	0.32
15	0.064	NS	NS	NS	0.25	0.17
16	0.12	NS	NS	NS	1.6	0.04
17	0.34	NS	NS	NS	0.27	NS
18	0.055	NS	NS	NS	NS	NS

Notes: 1) Concentrations in mg/kg
2) NS = No Sample

Total Mercury was detected in 12 of the 28 tissue samples collected during implementation of the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan. Total Mercury concentrations in whole-body tissue samples collected from CS-B, CS-D, the Borrow Pit Lake, Reference Area 1

and Reference Area 2 during implementation of the Sauget Area 1 Support Sampling Plan are summarized below.

Summary of Toal Mercury Concentrations in Sauget Area 1 Biota (Whole Body) Samples

Sample		CS-B	CS-D	Borrow Pit Lake	Reference Area 1	Reference Area 2
Bottom Feeder Fish	1	NS	NS	0.05	0.1	0.05
	2	NS	NS	0.075	0.086	NS
	3	NS	NS	0.26	NS	NS
Forage Fish	1	ND (0.095)	0.018	0.052	0.05	0.051
	2	NS	NS	0.6	NS	0.064
	3	NS	NS	ND (0.1)	NS	0.046
Predator Fish	1	NS	NS	ND (0.016)	0.097	NS
	2	NS	NS	0.057	0.14	0.1
	3	NS	NS	0.064	NS	NS
Shrimp		NS	NS	ND (0.091)	ND (0.091)	ND (0.083)
Clams	1	NS	NS	ND (0.074)	ND (0.0.95)	ND (0.074)
	2	NS	NS	ND (0.091)	NS	ND (0.077)
	3	NS	NS	ND (0.10)	NS	NS
Snails		ND (0.0.071)	ND (0.077)	NS	ND (0.087)	ND (0.091)

Notes: 1) Concentrations in mg/kg

2) A composite snail sample was also collected in Creek Segment C. Mercury = ND (0.077)

Comparison of average Total Mercury concentrations in Sauget Area 1 sediment and biota samples, using half of the detection limit for non detects, allows an initial assessment of the bioavailability of mercury in sediments. While average Total Mercury concentrations in Creek Segment B and Creek Segment D sediment samples are an order of magnitude higher than average sediment concentrations in the Reference Areas 1 and 2 sediment samples, average bicta concentrations are lower (0.035 ppm vs. 0.055 ppm), which indicates that mercury is not bioaccumulating in Creek Segments B and D:

Summary of Average Total Mercury Concentrations in Sauget Area 1 Sediment and Biota Samples

Sample	CS-B	CS-D	Borrow Pit Lake	Reference Area 1	Reference Area 2

Sediment	1.287	0.043	0.120	0.053	0.044
Biota	0.042	0.028	0.127	0.062	0.047

Note: 1) Concentrations in mg/kg

Average Total Mercury concentrations in sediment and biota from the Borrow Pit Lake are essentially the same (0.120 vs. 0.127). Average tissue concentrations are higher in the Borrow Pit Lake than in CS-B, CS-D and the two Reference Areas. This evidence for bioaccumulation depends upon one outlier forage fish tissue concentration of 0.6 ppm. Removing this outlier from the Borrow Pit Lake biota data set results in an average biota mercury concentration of 0.074 ppm in the Borrow Pit Lake, which is an order of magnitude lower than the average Borrow Pit Lake sediment concentration of 0.120 ppm and 0.012 to 0.027 mg/kg higher than fish tissue concentrations in the Reference Areas.

Additional sediment sampling and analysis in the Borrow Pit Lake, as required by the Sediment Removal Action UAO, is needed to determine whether or not bioavailable Mercury is present in these sediments and, if so, where it is located. Incorporation of existing information on the distribution and occurrence of mercury in Dead Creek and the Borrow Pit Lake is critically important to developing a sampling plan that will effectively characterize the distribution of mercury species in the Borrow Pit Lake. Not understanding these data could result in improper sampling plan design, incorrect risk assessment conclusions and inappropriate risk management decisions.

4.2 Sampling Program Objectives and Rationale

4.2.1 Sediment Sampling

Mercury was selected as a COPC in the 2001 Menzie Cura Sauget Area 1 Ecological Risk Assessment due to exceedance of ecological thresholds and identified as a COC due to toxicity to fish and fish-eating birds. The Borrow Pit Lake Investigation Plan is designed to address three nature and extent of mercury migration issues that were not resolved during implementation of the Sauget Area 1 Ecological Risk Assessment, namely:

1) What is the aerial distribution of mercury in the Borrow Pit Lake downstream of Dead Creek;

2) Where do mercury concentration highs (i.e. "hot spots") occur in the Borrow Pit Lake; and
3) Where do mercury concentrations in Borrow Pit Lake sediments exceed site-specific, risk-based concentrations?

Results obtained during implementation of the Borrow Pit Lake Investigation Plan will be used to determine if mercury is uniformly distributed in the Borrow Pit Lake or if it occurs in "hot spots" (concentration highs). Mercury concentration and speciation data obtained during implementation of Borrow Pit Lake Sampling Plan will also be used, in conjunction with existing Borrow Pit Lake fish tissue data, to establish site-specific, risk-based concentrations for biologically-available mercury and identify those areas, if any, that need to be remediated in order to protect fish or fish-eating birds. Containing or removing "hot spots" (concentration highs) that cause exceedance of site-specific, risk-based levels are appropriate removal/remedial actions in an adversely impacted habitat. Consequently, it is important to know if mercury is uniformly distributed in the Borrow Pit Lake sediments or if mercury concentration highs ("hot spots") occur.

Evaluating existing data on the nature and extent of mercury in the Dead Creek watershed is a critical component of the design of a sampling plan for the Borrow Pit Lake. It is appropriate to include this evaluation in the Mitigation Plan because it allows assessment of known mercury distribution and how this distribution might reflect mercury distribution in the Borrow Pit Lake. Such distributions need to be taken into consideration in the design of the Borrow Pit Lake sediment-sampling program and in interpretation of the results. For example, if mercury in Creek Segments B, C, D, E or F sediments was wholly, or in part, due to migration from sources in the Dead Creek watershed, there could be "hot spots" in creek channel sediments and, therefore, "hot spots" (concentration highs) in the Borrow Pit Lake at and/or downstream of its confluence with Dead Creek.

Distribution of mercury in Dead Creek and Borrow Pit Lake sediments is discussed below.

Dead Creek - Mercury analytical data is available for sediment samples collected in Dead Creek as part of the Sauget Area 1 Support Sampling Plan. These results are summarized below, by creek segment, with the upstream sample in each segment listed first:

Summary of Pre-Removal Action Mercury Concentrations in Dead Creek Sediments

Creek Segment	Sample 1	Sample 2	Sample 3	Average Concentration
CS-B	0.96	1.5	1.4	1.28
CS-C	0.66	0.64	0.58	0.63
CS-D	0.5	0.42	0.35	0.42
CS-E	0.51	0.3	0.3	0.37
CS-F	0.3	1.1	0.45	0.62

Notes: 1) Concentrations are in mg/kg
2) Sediment Quality Guidelines Threshold Effects Concentration (TEC) = 0.18 mg/kg
3) Florida Sediment Quality Assessment Guidelines (TEL) = 0.13 mg/kg
4) Ontario Guidelines Lowest Effects Level (LEL) = 0.2 mg/kg

While all of these samples exceed ecological screening levels, none of these data indicate that mercury "hot spots" (concentration highs) are present in Dead Creek sediments. All sediments in Creek Segments B, C, D and E and Creek Segment F between Route 157 and the Borrow Pit Lake were excavated and transported to an on-site containment cell during the Sauget Area 1 Sediment Removal Action.

Borrow Pit Lake - During implementation of the Sauget Area 1 Support Sampling Plan, sediment samples were also collected in the Borrow Pit Lake to determine the impact, if any, of discharges from Dead Creek on the Borrow Pit Lake. If Dead Creek was a migration pathway from source areas in the upstream portion of its watershed to the Borrow Pit Lake, there should be a concentration high where Dead Creek discharges into the Borrow Pit Lake. Sediment deposition typically occurs when a stream enters a lake because water velocity decreases and the energy environment is too low to keep all of the sediments in suspension.

Four broad-scan sediment samples were collected to determine whether or not impacted sediment deposition was occurring at the mouth of Dead Creek, i.e. a concentration high or "hot spot". One sample was collected 3,000 ft. upstream of the confluence of Dead Creek and the Borrow Pit Lake in the backwater area, a second sample was collected 200 ft upstream of the confluence of Dead Creek with the Borrow Pit Lake, a third sample was collected at the mouth of Dead Creek and the fourth sample was collected 200 ft. downstream of the confluence. Mercury analyses from these samples are given below, along with copper and zinc concentrations, metals that are known site-specific constituents:

Summary of Sediment Metal Concentrations at the Confluence of Dead Creek and the Borrow Pit Lake

	Mercury	Copper	Zinc
Backwater of Borrow Pit Lake, 300 ft. Upstream of Confluence	0.091	48	320
200 ft. Upstream of Dead Creek Confluence	0.11	64	36

Mouth of Dead Creek	0.45	240	1,600
200 ft. Downstream of Dead Creek Confluence	0.16	36	250

Note: Concentrations in mg/kg

These data indicate that a metals "hot spot" (concentration high) occurs at the mouth of Dead Creek where the channel portion of Creek Segment F enters the Borrow Pit Lake. All sediments in Creek Segment F between Route 157 and the Borrow Pit Lake (the channel portion of CS-F) were excavated and transported to an on-site containment cell during the Sauget Area 1 Sediment Removal Action.

None of these data indicate there is a mercury concentration high ("hot spot") in the Borrow Pit Lake sediments. From an ecological impact perspective, mercury concentrations in two of the three sediment samples from the Borrow Pit Lake were lower than all three of the threshold values considered to pose ecological food chain risks:

Comparison of Borrow Pit Lake Sediment Concentrations to Ecological Screening Levels for Mercury

Borrow Pit Lake Sediment Concentration			Ecological Screening Levels		
Sample 1	Sample 2	Sample 3	TEC	TEL	LEL
0.091	0.11	**0.16**	0.18	0.13	0.2

Notes: **1) Concentrations are in mg/kg**
2) Concentrations higher than screening levels indicated in bold print
3) TEC = Sediment Quality Guidelines Threshold Effects Concentration
4) TEL = Florida Sediment Quality Assessment Guidelines
5) LEL = Ontario Guidelines Lowest Effects Level

One of the three Borrow Pit Lake sediment samples exceeded the lowest of the three ecological screening levels by 0.03 mg/kg.

Additional sampling is needed to determine the aerial distribution of mercury in the Borrow Pit Lake downstream of Dead Creek; to confirm or refute the observation that mercury concentration highs (i.e. "hot spots") do not occur in the Borrow Pit Lake; to provide the data that will allow site-specific, risk-based concentrations to be established for biologically-available mercury in Borrow Pit Lake sediments and to identify locations in the Borrow Pit Lake where sediments exceed site-specific, risk-based concentrations and removal action is appropriate.

4.2.2 Fish Sampling

Data collected in Dead Creek, the Borrow Pit Lake, Old Prairie du Pont Creek and Reference Areas 1 and 2 for use in the Sauget Area 1 Ecological Risk Assessment included the following:

Summary of Sauget Area 1 Support Sampling Plan Ecological Samples

	Sediment Samples					
	Industry Specific	Broad Scan	Sediment Bioassays	Tissue Samples Fish	Prey	Plants
Dead Creek	97	15	16	2	2	13
Borrow Pit Lake	8	3	3	12	4	NS
Old Prairie du Pont Creek	1	2	2	NS	NS	1
Reference Areas	0	4	2	11	7	1

Notes: 1) Industry-Specific Sediment Samples were analyzed for PCBs, TPH, Copper and Zinc
2) Broad-Scan Sediment Samples were analyzed for VOCs, SVOCs, Pesticides, Herbicides, PCBs, Dioxin, Metals, Mercury and Total Cyanide
3) Sediment bioassays consisted of acute and chronic exposure of Hyallela azteca and Chironomous tentans

These data were considered to have sufficient power to assess the risks associated with site-related constituents in Dead Creek and the Borrow Pit Lake and to confirm or refute the 1997 Ecology & Environment Preliminary Ecological Risk Assessment, which was a screening-level evaluation based on a eight sediment samples (6 samples from the channel of Creek Segment F and two samples from the Borrow Pit Lake) collected in one day.

During performance of the Sauget Area 1 Ecological Risk Assessment, mercury was identified as a constituent causing a potentially unacceptable impact to forage fish in the Borrow Pit Lake and birds (Great Blue Heron) feeding on the forage fish. One of 12 composite fish tissue samples from the Borrow Pit Lake had a mercury concentration (0.6 mg/kg) significantly above a threshold level reported in the literature to be harmful to fish (0.25 mg/kg):

Summary of Fish Tissue Mercury Concentrations in the Borrow Pit Lake

	Composite 1	Composite 2	Composite 3
Bottom Feeder Fish (Brown Bullhead - Whole Body)	0.05	0.075	**0.26**
Forage Fish (Whole Body)	0.052	**0.6**	ND (0.1)
Predator Fish			
– **Large Mouth Bass (Whole Body)**	ND (0.016)	0.057	0.064
– **White Crappie (Fillet)**	ND (0.02)	ND (0.01)	0.037

Notes: 1) Concentrations in mg/kg
2) Concentrations greater than literature-based 0.25 mg/kg toxicity level in bold print

Analytical data from twelve fish tissue samples (9 whole body and 3 fillet) collected from three different locations in the Borrow Pit Lake indicate that mercury in Borrow Pit Lake sediments is

not widely distributed, not biologically available or both. The Borrow Pit Lake Investigation Plan is designed to collect the information on mercury distribution and bioavailability in sediments to verify this observation.

Additional fish tissue sampling and analysis in the Borrow Pit Lake is not considered necessary for the following reasons:

1) The existing fish tissue database, which represents three trophic levels of fish (bottom feeder, forager and predator) collected across the entire Borrow Lake, may provide enough high-quality data to allow assessment of ecological impacts associated with mercury. What definitely needs to be augmented is data on the distribution and speciation of mercury in Borrow Pit Lake sediments. Such additional data will help resolve the issue of impacts on fish populations and piscivorous birds due to the presence of mercury in the Borrow Pit Lake;

2) Fish tissue sampling in the Borrow Pit Lake is difficult because the Metro East Sanitary District uses the BPL as a storm-water detention basin. When water levels in the Mississippi River and Old Prairie du Pont Creek are high, flap valves on the discharge pipes that conduct flow from Dead Creek beneath the levee close. Storm-water flow from Dead Creek is detained in the Borrow Pit Lake and allowed to backup until the water level reaches Elevation 10 ft. (local datum). This results in an impounded water depth of 6 to 7 feet at the downstream end of the BPL. When the BPL water level reaches EL 10 ft., the lift station pumps are turned on and water is pumped over the levee and into Old Prairie du Pont Creek. Operating the Borrow Pit Lake as a storm-water detention basin creates an aquatic habitat that is not conducive to producing a sustainable fish population; and

3) Fish present in the Borrow Pit Lake and Dead Creek probably enter these intermittent water bodies in the spring when water levels in Old Prairie du Pont Creek are high, but not high enough to close the flap valves on the pipes conducting flow beneath the levee, and when the culverts at the Terminal Railroad Embankment, Cargill Road, Old Route 3, Route 3, Route 157, Parks College parking lot, Edgar Street, Jerome Lane, Kinder Street, Edwards Street and Judith Lane are submerged. When water levels in Creek Segments B, C, D and E fall below the culvert inverts at Judith Lane, Edwards St., Kinder St., Jerome Lane, Edgar Street and the Parks College parking lot during dry weather conditions, a series of stagnant, discontinuous pools with no flow are created upstream of each road crossing. Pools in Creek Segments B, C, D and E routinely dewater or dry up in warm weather and/or low rainfall periods. The BPL was in the last stages of drying up when the Support Sampling Plan fish tissue sampling was conducted in October and November1999. Dead Creek and the Borrow Pit Lake are intermittent water bodies that are typically drying up or dry from late summer through winter. Annual dewatering/desiccation of Dead Creek and the BPL creates an aquatic habitat that is not conducive to a sustainable fish population.

4.3 Borrow Pit Lake Investigation Plan

4.3.1 Sample Location

Sediment samples will be collected immediately upstream, at and downstream of the confluence of Dead Creek with the Borrow Pit Lake to determine the aerial distribution of mercury in the Borrow Pit Lake downstream of Dead Creek; to confirm or refute the observation that mercury concentration highs (i.e. "hot spots") do not occur in the Borrow Pit Lake; to provide the data that will allow site-specific, risk-based concentrations to be established for biologically-available mercury in Borrow Pit Lake sediments and to identify locations in the Borrow Pit Lake where sediments exceed site-specific, risk-based concentrations and removal action is appropriate.

Evidence collected during implementation of the Support Sampling Plan supports the conclusion that industry-specific constituents were not deposited in the backwater portions of the Borrow Pit Lake upstream of the point where Dead Creek Segment F discharges into it. This conclusion is not based on one sample in the backwater area but on eight samples in the backwater area specifically collected with the intent of determining whether or not backwater deposition occurred in that portion of the Borrow Pit Lake upstream of Dead Creek. Sufficient sampling was done during implementation of the Sauget Area 1 Support Sampling Plan to make this determination. Additional sampling is not considered appropriate.

Observed distribution patterns of PCBs, TPH, Copper and Zinc, based on eight (8) samples in the Borrow Pit Lake upstream of the confluence of Dead Creek with the Borrow Pit Lake, nineteen (19) samples in Dead Creek immediately upstream of its confluence with the BPL and eleven (11) samples in the BPL downstream of the confluence with Dead Creek, indicate that backwater deposition of industry-specific constituents did not occur in the portions of the Borrow Pit Lake upstream of the confluence with Dead Creek. These constituents were selected to be indicative of the constituents released or potentially released in the upstream portions of the Dead Creek watershed. On September 9, 1999, USEPA approved their selection as indicator parameters when it approved the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan. The Agency also approved the sampling rationale and number of samples (8) selected to determine whether or not backwater deposition was occurring in the Borrow Pit Lake upstream of the confluence with Dead Creek.

Eight samples were collected upgradient of the confluence, spaced every 400 ft. from the north end of the Borrow Pit Lake, and analyzed for PCBs, TPH, Copper and Zinc. These data are

adequate to demonstrate the lack of backwater effects. For example, PCB concentrations ranged from ND to 6,290 ug/kg in Dead Creek upstream of the confluence of Dead Creek and the Borrow Pit Lake, were ND in the Borrow Pit Lake upstream of the Dead Creek confluence and ranged from 10 to 390 ug/kg downstream of the confluence. The highest observed PCB concentration downstream of the confluence, 390 ug/kg, was observed in the lift station sump at the Old Prairie du Pont Creek levee. Other than the one "hot spot" concentration of 390 ug/kg in the lift station sump, PCB concentrations downstream of the Dead Creek confluence were ND in 9 out of the 10 samples and 10 ug/kg in the tenth sample.

As can be seen from the analytical data presented below, this distribution pattern is repeated for Total Petroleum Hydrocarbons, Copper and Zinc:

Summary of Industry-Specific Analytical Results, Creek Segment F and Borrow Pit Lake Sediment Samples

Sample Number	PCBs (ug/kg)	TPH (mg/kg)	Copper (mg/kg)	Zinc (mg/kg)
Borrow Pit Lake Upstream of Dead Creek Confluence				
FASED-BPL-S1-0-10IN	ND (99.4)	23	9.9	380
FASED-BPL-S2-0-10IN	ND (109.3)	10	15	230
FASED-BPL-S3-0-8IN	ND (121.8)	4.6	14	300
FASED-BPL-S4-0-10IN	ND (109.9)	4	13	360
FASED-BPL-S5-0-9IN	ND (109.0)	6.6	13	280
FASED-BPL-S6-0-11IN	ND (119.5)	8.1	15	220
FASED-BPL-S7-0-9IN	ND (109.9)	4.3	18	410
FASED-BPL-S8-0-9IN	ND (119.5)	5.5	21	490
Creek Segment F Upstream of Borrow Pit Lake				
FASED-CSF-S31N-0-13IN	ND (2,770)	49	130	2,400
FASED-CSF-S30N-0-8IN	35	20	54	850
FASED-CSF-S29W-0-10IN	ND (121.8)	21	26	510
FASED-CSF-S28-0-10IN	6,290	220	1,200	3,200
FASED-CSF-S27E-0-16IN	1,850	44	1,900	6,200
FASED-CSF-S26W-0-13IN	573	75	930	4,700
FASED-CSF-S25E-0-10IN	1,046	71	2,500	6,200
FASED-CSF-S24W-0-13IN	192	47	530	3,200
FASED-CSF-S23-0-16IN	1,397	49	1,400	5,400
FASED-CSF-S22-0-20IN	1,095.2	50	420	4,800
FASED-CSF-S21-0-21IN	523	87	920	4,500
FASED-CSF-S20-0-12IN	456	50	710	2,300
FASED-CSF-S19-0-13IN	1,242.9	74	5,400	10,000
FASED-CSF-S18E-0-14IN	261	110	1,700	9,100
FASED-CSF-S17W-0-16IN	475	100	1,400	11,000
FASED-CSF-S16-0-20IN	13	18	33	3,900
FASED-CSF-S15W-0-28IN	64	31	430	7,700
FASED-CSF-S14W-0-15IN	437	91	480	3,200
FASED-CSF-S13W-0-15IN	241	77	370	2,100
Borrow Pit Lake Downstream of Dead Creek Confluence				
FASED-CSF-S12-0-15IN	ND (139.8)	16	80	680
FASED-CSF-S11W-0-10IN	ND (145.1)	11	88	690

FASED-CSF-S10-0-9IN	ND (124.7)	17	33	250
FASED-CSF-S9-0-11IN	ND (145.1)	24	78	400
FASED-CSF-S8-0-15IN	ND (121.8)	8.6	34	160
FASED-CSF-S7E-0-11IN	ND (115.1)	5.7	21	84
FASED-CSF-S6E-0-10IN	ND (118.9)	3.4	17	85
FASED-CSF-S5W-0-10IN	10	3	13	62
FASED-CSF-S4-0-7IN	ND (109.9)	2.7	10	50
FASED-CSF-S3E-0-6IN	ND (112.2)	3.8	17	63
FASED-CSF-S2-0-7IN	390	920	12	53

Data from 38 sediment samples collected in Creek Segment F down stream of the Terminal Railroad Embankment and the Borrow Pit Lake during implementation of the Sauget Area 1 Support Sampling Plan and presented above, indicate that constituents migrating via the surface water pathway in Dead Creek were not deposited in the backwater portions of the Borrow Pit Lake. Therefore, additional sampling in this area is not considered appropriate.

4.3.2 Sample Analysis

Sediment samples collected in the Borrow Pit Lake during implementation of the Sauget Area 1 Support Sampling Plan were analyzed for two analytes groups: 1) industry-specific analytes which included Total PCBs, Total Petroleum Hydrocarbons, Copper and Zinc and 2) broad-scan analytes which included VOCs, SVOCs, Pesticides, Herbicides, PCBs, Dioxin, Metals, Mercury and Total Cyanide. Detection limits for the following broad-scan analytes exceeded sediment screening-levels in all three of the sediment samples collected in the Borrow Pit Lake:

- Total Cyanide;
- 14 PAH Compounds;
- Bis(2-ethylhexyl)phthalate; and
- Hexachlorobenzene

Detection limits for the following broad-scan analytes exceeded screening criteria in some of the Borrow Pit Lake sediment samples:

- Silver;
- Total PCBs; and
- 10 Pesticide Compounds

Detection limits are very often higher than ecological screening levels because of the conservative nature of the screening levels and the inability of Agency-approved analytical

methods to achieve detection limits equal to or less than the screening levels. Considerable effort was made to achieve the lowest possible detection limits with USEPA-approved analytical methods as described in the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan Quality Assurance Project Plan (which was approved by USEPA on September 9, 1999).

In spite of these efforts, detection limits for some constituents were higher than their ecological screening levels. Constituents with detection limits that exceeded screening levels were retained as Constituents of Potential Concern (COPCs) in the June 2001 Menzie-Cura Sauget Area 1 Ecological Risk Assessment. COPCs selected using the Agency-approved process include Total PCBs, Dioxin TEQs and the following constituents:

SVOCs

- Bis(2-ethylhexyl)phthalate)
- Di-n-butylphthalate
- Diethylphthalate
- Pentachlorophenol

PAHs

- Acenapthalene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Dibenzo(a,h)anthracene
- Fluoranthene
- Indeno(1,2,3-c,d)pyrene

Pesticides

- Aldrin
- delta-BHC
- gamma-BHC
- alpha-Chlordane
- gamma-Chlordane
- Total DDT
- Dieldrin
- Endosulfan I
- Endosulfan II
- Endosulfan Sulfate
- Endrin Aldehyde
- Endrin Ketone
- Heptachlor
- Heptachlor Epoxide
- Methoyxchlor

Herbicides

- 2,4-D
- 2,4-DB
- Dicamba
- Dichloroprop
- MCPA
- MCPP

Metals

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Manganese
- Mercury
- Molybdenum
- Nickel
- Selenium
- Silver
- Vanadium
- Zinc

Inorganics

- Fluoride

Bis(2-ethylhexyl)phthalate, eight PAHs, 15 Pesticides, Total PCBs and Silver were included as COPCs even though detected concentrations exceeded screening levels. Inclusion of constituents on that basis is conservative and standard practice. Six PAHs (Anthracene, Benzo(a)anthracene, Chrysene, Fluorene, Napthalene and Phenanthrene) were not selected as COPCs because they were either not detected or were infrequently detected. PAHs with the greatest potential impact on ecosystems were included in the Sauget Area 1 Ecological Risk Assessment.

In addition, the detection limits achieved during analysis of the Sauget Area 1 Support Sampling Plan sediment samples do not indicate that high concentrations of the non-detect constituents are present. Detection limits for the COPCS that exceeded screening levels in all three Borrow Pit Lake sediment samples are summarized below:

Summary of COPC Detection Limits for Borrow Pit Lake Sediment Samples Exceeding Screening Criteria

PAHs, ug/kg	ESED - S1	ESED - S1FD	ESED - S2	ESED - S3
1) Acenapthene	470 UJ	470 UJ	500 UJ	470 UJ
2) Acenaphthylene	470 UJ	470 UJ	500 UJ	470 UJ
3) Anthracene	470 UJ	470 UJ	500 UJ	470 UJ
4) Benzo(a)anthracene	470 UJ	470 UJ	500 UJ	470 UJ
5) Benzo(a)pyrene	250 UJ	250 UJ	260 UJ	250 UJ
6) Benzo(b)fluoranthene	470 UJ	470 UJ	500 UJ	470 UJ
7) Benzo(g, h, I)perylene	470 UJ	470 UJ	500 UJ	470 UJ
8) Benzo(k)fluoranthene	470 UJ	470 UJ	500 UJ	470 UJ
9) Dibenzo(a,h)anthracene	250 UJ	250 UJ	260 UJ	250 UJ
10) Fluorene	470 UJ	470 UJ	500 UJ	470 UJ
11) Indeno(1,2,3-cd)pyrene	470 UJ	470 UJ	500 UJ	470 UJ
12) Napthalene	470 UJ	470 UJ	500 UJ	470 UJ
13) Phenanthrene	470 UJ	470 UJ	500 UJ	470 UJ
14) Pyrene	470 UJ	470 UJ	500 UJ	470 UJ

Herbicides, ug/kg	ESED - S1	ESED - S1FD	ESED - S2	ESED - S3
1) 2,4,5-T	23 UJ	23 UJ	24 UJ	23 UJ
2) 2,4,5-TP (Silvex)	23 UJ	23 UJ	24 UJ	23 UJ
3) 2,4-DB	23 UJ	23 UJ	24 UJ	23 UJ
4) Dalapon	180 UJ	180 UJ	190 UJ	180 UJ

5) Dicamba	55 UJ	55 UJ	58 UJ	56 UJ
6) Dichloroprop	280 UJ	270 UJ	290 UJ	280 UJ
7) Dinoseb	280 UJ	270 UJ	290 UJ	280 UJ
8) MCPA	5500 UJ	5500 UJ	5800 UJ	5600 UJ
9) MCPP	5500 UJ	5500 UJ	5800 UJ	5600 UJ
10) Pentachlorophenol	47 UJ	47 UJ	50 UJ	47 UJ

PCBs, ug/kg	ESED - S1	ESED - S1FD	ESED - S2	ESED - S3
Monochlorobiphenyl	46 UJ	9.2 UJ	9.7 UJ	9.2 UJ
Dichlorobiphenyl	46 UJ	9.2 UJ	9.7 UJ	9.2 UJ
Trichlorobiphenyl	46 UJ	9.2 UJ	9.7 UJ	9.2 UJ
Tetrachlorobiphenyl	95 UJ	19 UJ	20 UJ	19 UJ
Pentachlorobiphenyl	95 UJ	19 UJ	20 UJ	19 UJ
Hexachlorobiphenyl	95 UJ	19 UJ	20 UJ	19 UJ
Heptachlorobiphenyl	140 UJ	28 UJ	29 UJ	28 UJ
Octachlorobiphenyl	140 UJ	28 UJ	29 UJ	28 UJ
Nonachlorobiphenyl	230 UJ	46 UJ	49 UJ	46 UJ
Decachlorobiphenyl	230 UJ	46 UJ	49 UJ	46 UJ

SVOCs, ug/kg	ESED - S1	ESED - S1FD	ESED - S2	ESED - S3
Bis(2-ethylhexyl)phthalate	470 UJ	470 UJ	500 UJ	470 UJ
Hexachlorobenzene	190 UJ	190 UJ	200 UJ	190 UJ

Inorganics, mg/kg	ESED - S1	ESED - S1FD	ESED - S2	ESED - S3
Silver	2.8 UJ	2.8 UJ	0.79 UJ	2.5 UJ
Total Cyanide	1.4 UJ	1.4 UJ	1.5 UJ	1.4 UJ

Based on this information, high detection limits are not masking the presence of constituents that could have an adverse ecological impact. MCPA (2-Methyl-4-Chlorophenoxyacetic Acid) and MCPP (2-Methyl-4-Chlorophenoxypropionic Acid) are the only two constituents with detection limits high enough to indicate that significant concentrations of these two herbicides might be present in Borrow Pit Lake sediments. Sediment screening levels are not available for MCPA and MCPP. For these reasons, it is not appropriate to include SVOCs, Herbicides, PCBs, Metals and Total Cyanide analyses in the further investigation of Borrow Pit Lake sediments required by the Sediment Removal Action UAO. It is appropriate to focus this investigation on Mercury.

4.3.3 Sampling Plan

Sediment samples will be collected in the Borrow Pit Lake on a 200 ft grid in order to evaluate the distribution of mercury in sediments immediately upstream, at and downstream of the confluence of Dead Creek with the BPL. Samples will be collected from the center of each grid cell at a depth of 0 to 6 inches below ground surface to characterize the biologically active zone (Figure 4-1). Samples will be collected at every odd-numbered grid cell (approximately 50 percent of the sampling locations) from a depth of 6 inches to the bottom of the sediment profile, which is typically 8 to 15 inches thick, to characterize the remainder of the sediment column.

Number of Sediment Samples:	56	
Analyses:	Total Mercury	USEPA Method
	Methyl Mercury	USEPA Method 1630/1631

Specialized analytical laboratories capable of performing mercury-speciation analyses, such as the Battelle Marine Sciences Center, Brooks Rand or equivalent, will perform the Borrow Pit Lake sediment analyses. Sampling locations will be finalized in the field with the concurrence of USEPA Region V or its designee. Sampling methods, procedures and protocols will be the same used for the Sauget Area 1 EE/CA and RI/FS Support Sampling Plan and associated Field Sampling Plans and Quality Assurance Project Plans.

QA/QC Samples - QA/QC samples will consist of one duplicate per ten, or fraction of ten, environmental samples collected and one MS/MSD or spike duplicate per twenty, or fraction of twenty, environmental samples collected. Duplicate, MS/MSD, and spike duplicate samples will be submitted for analysis. Duplicate samples are collected to measure consistency of field sampling technique. MS/MSD and spike duplicate samples are collected to measure laboratory quality control procedures. A field blank (or equipment blank) must be submitted to the laboratory with the investigative samples and analyzed for the same parameters as the investigative samples. The minimum required is one per ten, or fraction of ten, environmental samples collected, unless dedicated or disposable sampling equipment is used to collect the samples.

Field Procedures - Coordinates for each sampling location will be established from existing topographic surveys prior to undertaking the sampling effort. This will be accomplished by overlaying a 200 ft by 200 ft grid pattern over the Borrow Pit Lake on the site topographic map. A GPS unit will be used in the field to navigate to each sampling location based on these pre-established coordinates.

Sediment samples will be collected using a manual push-type sediment core sampler. The sampler consists of a PVC barrel, polycarbonate (Lexan®) liner, check valve, extension rods, and a "T" handle. A liner will be placed into the bottom of the tube and secured in place. The sampler will then be pushed into the sediment, collecting a sediment sample from 0 to 18 inches below the top of the sediment. Sediment will then be pulled up, creating a slight vacuum that closes the check valve. The tube will be removed from the sampler, and the sediment will be placed into the sample containers. Where water depths require, extensions will be added to the sample tube to facilitate collecting the sediment sample. In these instances, a boat will be used to reach the sampling location. Sample containers will be placed on ice in coolers. Chain-of-custody procedures will be followed. After each sampling location or when all decontaminated sampling equipment has been used, sampling equipment will be decontaminated according to the procedures outlined below.

Decontamination - The following procedures will be used for sampling equipment decontamination:

- Brush-wash reusable equipment in a bucket or tub using a trisodium phosphate (TSP) or other commercial detergent solution (2 lb of TSP per 10 gal of clean water). Completely brush the entire exterior surface of the article undergoing decontamination. Wash interior wetted surfaces as required. Rinse the item with copious quantities of potable water, followed by a distilled water rinse.
- Rinse reusable sampling equipment used to collect environmental media for metals analysis in a dilute nitric acid solution, followed by a distilled water rinse.
- Air-dry sampling equipment on a clean, non-plastic surface in a well-ventilated, uncontaminated environment. If the sampling device is not to be used immediately, wrap it in aluminum foil and place it in a plastic bag or storage container.

- Contain rinse water in a plastic tub with a lid. Empty the contents of this tub daily into a 55 gallon drum located at the IDW storage area.

Documentation - A field notebook will be kept for the sediment sampling activity. At a minimum, the field notebook will include the project name and number, date and time, weather conditions, sampler's name, sample location, limiting field conditions, problems encountered, subcontractor personnel on-site, USEPA Region 5 personnel on-site, and other personnel on-site. Notation of USEPA Region 5 acceptance of sampling locations will be included in the field notebook.

Data Validation - 100 percent of the mercury analyses will be validated using Tier 3 Criteria and 10 percent of the data will be validated using Tier 4 Criteria. Validation methods, procedures and protocols described in the Sauget Area 1 Data Validation Plan will be used to perform the data validation.

4.2 Borrow Pit Lake Remediation Plan

The Sediment Removal Action UAO required preparation of a Mitigation Plan that included a plan for remediation of the Borrow Pit Lake. To comply with the UAO, a Borrow Pit Lake Remediation Plan was included in the Dead Creek Mitigation Plan. Before a remediation plan can be proposed, the Borrow Pit Lake Investigation Plan must be implemented.

After completion of the Borrow Pit Lake Investigation Plan, validated analytical data will be used to determine the aerial distribution of mercury in the Borrow Pit Lake downstream of Dead Creek; to confirm or refute the observation that mercury concentration highs (i.e. "hot spots") do not occur in the Borrow Pit Lake; to provide the data that will allow site-specific, risk-based concentrations to be established for biologically-available mercury in Borrow Pit Lake sediments and to identify locations in the Borrow Pit Lake where sediments exceed site-specific, risk-based concentrations and removal action is appropriate.

A three-step Borrow Pit Lake Remediation Plan is appropriate to identify risks associated with Mercury in the Borrow Pit Lake and any remedial measures that might be needed to mitigate those risks:

1) Collect additional Borrow Pit Lake sediment samples, analyze them for Total Mercury and Methyl Mercury and contour the Total Mercury and Methyl Mercury concentrations to determine if mercury is wide spread, if there are identifiable concentration highs (mercury "hot spots) or both. "Hot spots" will be quantified by contouring the mercury concentration data to determine if there are identifiable areas of higher mercury concentrations or if the mercury is wide spread. Mercury distribution patterns may help determine the source of the mercury. For example, a concentration high at the confluence of the Dead Creek and the Borrow Pit Lake could indicate fluvial deposition from a source along Dead Creek. A concentration gradient from the confluence to the lift station at Old Prairie du Pont Creek could also indicate a source along Dead Creek. A relatively uniform distribution in the BPL could indicate an anthropomorphic source such as atmospheric fall out from coal-fired power plants (air deposition) or background concentrations;

2) Compare bioavailable Methyl Mercury concentrations in Borrow Pit Lake sediments to screening criteria such as the Sediment Quality Guidelines (TEC = 0.18 mg/kg), the Florida SQAG (TEL = 0.13 mg/kg) or Ontario Guidelines (LEL = 0.2 mg/kg) to determine whether or not there is a potential for risk; and

3) If there is a potential for risk, based on exceedance of screening-level concentrations, determine a site-specific, risk-based Methyl Mercury concentration that will protect fish and piscivorous birds. The mercury speciation data from the Borrow Pit Lake Investigation Plan would be used, along with the existing Borrow Pit Lake fish tissue Total Mercury data (9 whole body composites and 3 fillet composites), to determine a mercury uptake factor for fish. This uptake factor would then be used to calculate a site-specific, risk-based concentration for methyl mercury that is protective of fish and fish-eating birds, which would be integrated into an EE/CA for the Borrow Pit Lake.

On completion of the mercury risk assessment, an EE/CA can be performed to evaluate remedial alternatives and identify an appropriate remedy.